The Woodworker's Journal

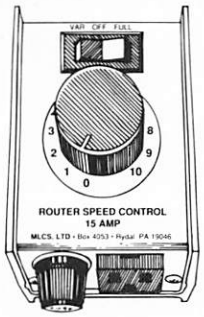
Vol. 14, No. 3 $3.95

0 73361 64856 3 05

Included in this issue: **Shaker Tall Clock • Stackable Shoe Rack Tabletop Armoire • Child's Stepped-Back Cupboard Cat Push Toy • Victorian Wall Shelf**

May/June 1990

MLCS Ltd.



CONTROL THE SPEED OF YOUR ROUTER - ROUT AT THE SPEED THAT GIVES THE BEST RESULTS WITH THE WOOD AND BIT YOU ARE USING!

NOW ONLY **$39.95** Order Item #200

FEATURES:

- **Speed Adjustable from Full Speed to 0 RPM**
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- **Gives Your Router a Feature Only Available on Routers Costing Hundreds of Dollars!**
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- *Less Noise and Softer Starts at Lower Speeds*

EASY TO USE - Simply plug in Speed Control and plug your router into the Speed Control - turn dial for best results. (Speed Control has a clip that can be worn on your belt or hung on wall or left loose.)

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ITEM NO.	BEST CUT BEST PRICE	DESCRIPTION	ANGLE/DEPTH/RADIUS CIRCLE DIAMETER	LARGE DIA.	CUTTING LENGTH	SHANK SIZE	PRICE
#490		1¼" **Classical**		1¼"	⅝"	¼"	$22.50
#491		1½" Classical		1½"	¾"	¼"	$25.00
#792		1½" Classical		1½"	⅞"	½"	$25.00
#231		5/32" **Roman Ogee**	5/32" R	1¼"	15/32"	¼"	$17.00
#232		¼" Roman Ogee	¼" R	1½"	¾"	¼"	$18.00
#661		¼" Roman Ogee	¼" R	1½"	¾"	½"	$21.00
#340		⅛" **Cove**	⅛" R	⅝"	½"	¼"	$12.00
#341		¼" Cove	¼" R	1"	½"	¼"	$13.00
#342		⅜" Cove	⅜" R	1¼"	9/16"	¼"	$14.00
#343		½" Cove	½" R	1½"	⅝"	¼"	$15.00
#644		¾" Cove	¾" R	1⅞"	¾"	½"	$28.00
#350		⅛" **Round Over**	⅛" R	¾"	½"	¼"	$11.00
#351		3/16" Round Over	3/16" R	⅞"	½"	¼"	$11.00
#230		¼" Round Over	¼" R	1"	½"	¼"	$12.00
#354		⅜" Round Over	⅜" R	1¼"	⅝"	¼"	$15.50
#355		½" Round Over	½" R	1½"	¾"	¼"	$17.00
#656		¾" Round Over	¾" R	2"	⅞"	½"	$21.00
#657		1" Round Over	1" R	2½"	1"	½"	$33.00
#370		⅜" **Rabbeting**	⅜" Deep	1¼"	½"	¼"	$14.00
#670		⅜" Rabbeting	⅜" Deep	1¼"	½"	½"	$14.00
#366		⅛" **Slot Cutter**	⅜" Deep	1¼"	⅛"	¼"	$14.00
#368		¼" Slot Cutter	⅜" Deep	1¼"	¼"	¼"	$14.00
#403		⅜" **Dovetail**	9 degree	⅜"	⅜"	¼"	$ 7.50
#405		½" Dovetail	14 degree	½"	½"	¼"	$ 8.50
#409		¾" Dovetail	14 degree	¾"	⅞"	¼"	$10.50
#709		¾" Dovetail	14 degree	¾"	⅞"	½"	$10.50
#402		⅜" Dovetail	8 degree For	⅜"	½"	¼"	$12.00
#404		½" Dovetail	8 degree Leigh	½"	13/16"	¼"	$12.00
#708		11/16" Dovetail	8 degree Jigs	11/16"	1"	½"	$14.00

ITEM NO.	BEST CUT BEST PRICE	DESCRIPTION	ANGLE/DEPTH/RADIUS CIRCLE DIAMETER	LARGE DIA.	CUTTING LENGTH	SHANK SIZE	PRICE
#415		¼" **Core Box**	round nose	¼"	¼"	¼"	$10.00
#416		⅜" Core Box	round nose	⅜"	⅜"	¼"	$11.00
#417		½" Core Box	round nose	½"	11/32"	¼"	$14.00
#418		¾" Core Box	round nose	¾"	⅝"	¼"	$15.00
#719		1" Core Box	round nose	1"	¾"	½"	$18.00
#470		¼" **Straight**	plunge cutting	¼"	¾"	¼"	$ 7.00
#471		5/16" Straight	plunge cutting	5/16"	1"	¼"	$ 7.00
#472		⅜" Straight	plunge cutting	⅜"	1"	¼"	$ 7.00
#474		½" Straight	plunge cutting	½"	1"	¼"	$ 7.00
#775		½" Straight	plunge cutting	½"	2"	½"	$14.00
#476		9/16" Straight	plunge cutting	9/16"	1"	¼"	$ 7.00
#478		⅝" Straight	plunge cutting	⅝"	1"	¼"	$ 8.00
#479		¾" Straight	plunge cutting	¾"	1"	¼"	$10.00
#781		1" Straight	plunge cutting	1"	1½"	½"	$12.00
#500		⅜" **Flush**	**Trimming**	⅜"	½"	¼"	$ 7.00
#502		½" Flush	Trimming	½"	½"	¼"	$ 7.50
#503		½" Flush	Trimming	½"	1"	¼"	$ 8.50
#804		½" Flush	Trimming	½"	13/16"	½"	$ 9.00
#545		**Tongue & Groove**	Straight	1⅝"	1"	¼"	$29.00
#845		Tongue & Groove	Straight	1⅝"	1"	½"	$29.00
#546		Tongue & Groove	Wedge	13/16"	1"	¼"	$29.00
#846		Tongue & Groove	Wedge	1⅝"	1"	½"	$29.00
#450		⅛" **Beading**	⅛" R	¾"	½"	¼"	$11.00
#451		3/16" Beading	3/16" R	⅞"	½"	¼"	$11.00
#233		¼" Beading	¼" R	1"	½"	¼"	$13.00
#453		5/16" Beading	5/16" R	1⅛"	½"	¼"	$14.00
#454		⅜" Beading	⅜" R	1¼"	⅝"	¼"	$15.50
#455		½" Beading	½" R	1½"	¾"	¼"	$17.00
#375		**45 degree**	45 degree	1 1/2"	5/8"	¼"	$15.00
#676		**Chamfer**	45 degree	1 7/8"	7/8"	½"	$23.00

New 24-page catalogue now available, featuring hundreds of bits.

MAKE BEAUTIFUL RAISED PANEL DOORS . . . WITH YOUR 1/4" ROUTER!

Professional production quality bit makes it quick and easy to produce matching rails and stiles — the panel raising bit with ball bearing guide makes the raised panel perfect every time.

SALE PRICE **$69.95** FOR COMPLETE SET

Regular value Over $150.00

ORDER ITEM # 554 for 1/4" Shank Set (Includes all bits shown below)

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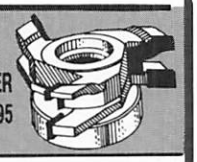
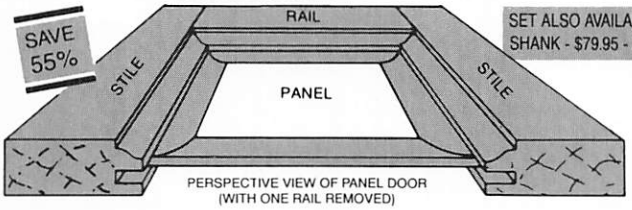
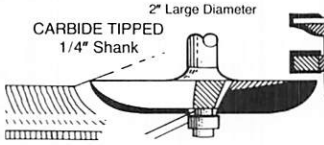




PERSPECTIVE VIEW OF PANEL DOOR (WITH ONE RAIL REMOVED)

SET ALSO AVAILABLE IN ½" SHANK - $79.95 - Item #852

RAISED PANEL BIT SUPPLIED WITH BALL BEARING



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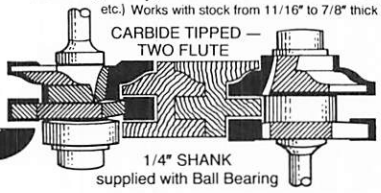
(For making matching rails and stiles in raised panel doors, etc.) Works with stock from 11/16" to 7/8" thick



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The Woodworker's Journal

MAY/JUNE 1990 VOLUME 14, NUMBER 3

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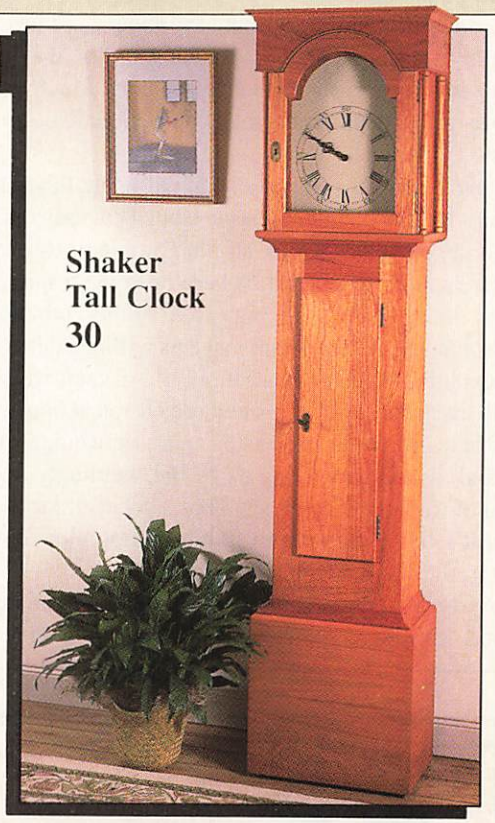

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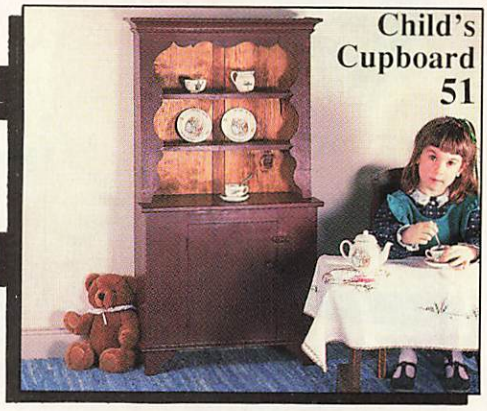

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Shoptalk

We have barely managed a toehold into this new decade and suddenly it seems that many of our priorities are being reshuffled. The dramatic political changes now sweeping Eastern Europe have raised the hope that somehow we can all achieve some middle ground of understanding. Then we can begin working together to deal with the environmental problems we've all created; problems which may ultimately prove more devastating than the nationalistic quarrels of the past.

I have serious reservations about using this publication as a forum for environmental issues, but as woodworkers we cannot divorce ourselves from all the problems brought about by deforestation, whether it be here or in the tropics. Naturally we hope that supplies of imported timber remain available at reasonable cost. Does that make us willing agents in the process of exploitation and destruction? If so, then we share the guilt with everyone who wants and uses tropical hardwood products.

There has been increasing media coverage of the possible global disasters awaiting us by the seemingly wanton destruction of tropical rain forests. That's hopeful, for the threat is real and it's being recognized. But let's not allow emotionalism to get in the way of working out solutions.

Associate editor Tom Clark's article on endangered tropical wood species in this issue focuses on the fact that the destruction of tropical forests is the result of many social, political and economic factors. Unfortunately, there are layers of charges and countercharges, and much misinformation yet remains to be sorted out. Perhaps the one real glimmer of hope is the conclusion of a Smithsonian Institution workshop that the tropical forests will be preserved only if they are perceived as having economic value. When you're talking money, people will listen.

The great majority of projects in ***The Woodworker's Journal*** call for the use of domestic lumber. Generally, our use of tropical hardwoods has been limited to veneers and small solid wood projects such as jewelry boxes. This issue is an exception as some major projects call for the use of teak. If our choice offends some readers, I apologize, but until more accurate information establishes that the tropical hardwood industry is responsible for a large proportion of the damage, I do not feel that a total ban on tropical timber at this time is the answer. The economic impact of such a ban may cause more problems than it cures.

As individuals we can help by keeping informed. We then will be better prepared to offer our support to rational programs which foster the intelligent and equitable management of this earth's precious forest resources.

Jim McQuillan

Grizzly

INTRODUCING AN All New LINE-UP!

STAPLER

An excellent, lightweight unit that is very well balanced. Weighs only 2.5 lbs! Takes 100 18 gauge staples. Comes with safety. (Safety tip not shown).

MODEL G1847 ONLY $89.95

BRAD NAILER

A favorite for casing and finish carpentry work. Nicely balanced and weighs only 2.62 lbs. Takes 100 18 gauge nails. Comes with safety.

MODEL G1852 ONLY $99.95

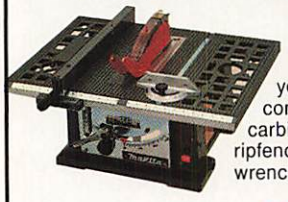
SUPER BRAD NAILER

The best all-around finishing gun with safety. Well balanced, lightweight — weighs only 3.3 lbs! Takes 150 18 gauge nails.

MODEL G1861 ONLY $129.95

Makita

2708W 8¼" TABLE SAW



This lightweight, yet powerful saw comes complete with carbide-tipped blade, ripfence, miter gauge and wrenches.

MODEL G2028 ONLY $279.95

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LS1020 10" MITERSAW

This portable 40 lb. saw is the perfect companion for contractors. Comes complete with combination blade, socket wrench, dust bag and vise.

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Makita

LS1440 14" MITERSAW

This 14" powerhouse comes with a combination blade, dust bag, socket wrench and vise. Clean miter cutting up to 45° right or left. Powerful 12 AMP motor.

MODEL G2026 ONLY $429.95

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90-105

Quality Woodworking Machines At Affordable Prices

Super 15" Scroll Saw

On Sale ... **$119.95**

(Includes $52 ***FREE*** Accessories)

Cut intricate wood patterns with this versatile machine. Features:

- **Parallel rocker arm cutting system** - eliminates blade breakage & sanding.
- **E-Z set blade change system** - permenant, upper arm blade holder plus **new** E-Z Jig for standard holders.
- **FREE Accessories** - 1 dz blades, extra blade holders, E-Z set system, Plastic lettering guide set .. a $52 Value

SPECIFICATIONS:

• Cast iron construction • 15" throat • Motor: 1/8 HP, TEFC, 1650 RPM, 110V, UL Listed • 3/4" stroke • 2" depth of cut • Table tilts to 45° • 43 Lbs.

Item #SAW .....$119.95 (UPS $10)

Scroll Saw Accessories

Dust Blower

Installs between lower arm and base - keeps your pattern line visible at all times. Installation instructions included.

#BKT .... $15.00/Kit (•)

Saw Stand *(On Sale)*

34" High -perfect height & a great convenience.

#STD ... (Reg $39)

On Sale .. $26

(UPS $4)

Neptune 1-1/2" Lettering Guides

(**Free** w/purchase of Saw). Includes upper & lower case alphabet + numbers + free patterns. **#LN1** ..... **$12**/set (•)

Scroll Saw Blades (5")

#BPK - 4dz asst. (2dz Pin, 2dz #9)...**$14**(•)

#BPS - 2dz Spiral blades (size #2)...**$10**(•)

"E-Z Set Plus" Blade Holder System

(**Free** w/purchase of Saw). Includes permenant pivoting blade clamp that mounts to the top arm (Simplifies attaching blades for internal cuts). **Plus** our NEW E-Z Jig that makes inserting blades into standard blade holder (in lower arm) simple.

Item **#EZ2**.....**$17** /kit (•)

Magnifier Lamp

Great for magnifying scroll work or closeup work of any kind.

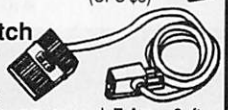
- •175% mag
- •39" flex arm
- • UL approved
- • 60 Watts Incand.

#SML (reg 29.95) **On Sale ...$22.95**

(UPS $3)

Foot Switch

"Momentary" (deadman) type - installs in line with Saw power cord. 7 Amp, 6 ft, For hands free operation of Scroll Saw.



#FSW ..... $ 20.00 (•)

Super 125 Planer

On Sale **$349.95**

This machine will pay for itself time and again by planing your own wood. Finishes wood like machines many times its price.

• **Portable** at 65 lbs • **Power feed** •12 1/2" wide High Speed Steel Knives Shipped assembled and ready to run.

SPECIFICATIONS:

Motor: 16Amp, 115V, 8000RPM, 2HP• 26.2 fpm auto feed rate • 16,000 Cuts/min • Thickness of stock: 3/16" - 6" • 1/8" Max depth of cut • 2 HSS knives

Item #PLA ..... $349.95 (UPS $15)

Planer Accessories

Free plans for Roller Stand with purchase of rollers

Extra Set of 2 Knives

High Speed steel, 12-1/2" long.

Item #PKN .....$25.00/set (•)

Dust Chute

For vacuum takeoff of wood chips.

#PDS ..(reg $24), **On Sale....$15** (UPS $3)

Planer Stand (Heavy duty)

Drilled for Super 125 Planer. 27-1/4"High.

#PST ...(Reg $44), **On Sale...$39/ea** (UPS $6)

Roller Stand

HTC brand support stand w/heavy duty ball bearing roller. Height adjusts from 25" - 44".

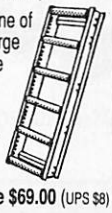
#PRS ...(reg $40), **On Sale** ...**$35** (UPS $4)

Ball Bearing Rollers

(Minimum purchase 2 rollers). Build a roller stand, infeed/outfeed table etc. with these 13" X 2" Heavy Duty rollers. Includes **FREE** plans for roller stand shown above.

Item **#BBR** ..... **$6.50/ea** ($3 UPS /order)

Conveyer Section (4'x12")



Sooner or later you'll need one of these. A must for feeding large pieces through planers, table saws, etc.. Steel Channels, 4' x 12" overall, 1-3/8" dia. ball bearing rollers, Wt: 35#. The best value in conveyer sections anywhere !

#BCS ..(reg. $99) , **On Sale $69.00** (UPS $8)

Penn State's Commitment

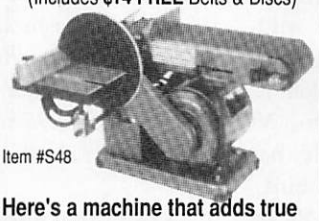
We unconditionally guarantee your satisfaction with our fine machines. All of our machines carry a Thirty day Money Back Guarantee and One year Warranty for Parts and Labor

New Model with 8" disc

Two way 4"x 8" Sander

On Sale ... **$114.95** (UPS $8)

(Includes **$14 FREE** Belts & Discs)



Item #S48

Here's a machine that adds true versatility to your shop.

New design uses **universally available 8**" discs, 4" x 36" belts • Includes Assortment Of 3 Belts, 4 Discs Of Various Grits • **Built in Dust Collection** outlet • Aluminum table: tilts to allow bevel sanding to 45°, includes mitre gauge, movable for use with disc or belt • Belt tilts to any position from horizontal to vertical • **Quick release lever** for changing belts • **Single action tracking** adjustment • Motor 1/3HP, 1720RPM, 115V • Weight : 40Lbs

DC-1 Dust Collector

(Includes $15 ***FREE*** Hose & Fittings)

On Sale .. $189.95

(UPS $20)

Item #DC1

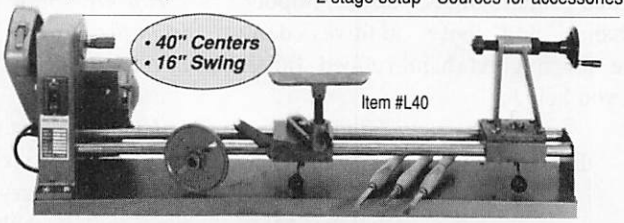
Keep your shop clean and safe from saw dust with this large capacity, commercial style system.

SPECIFICATIONS:

1HP • 110/220V (pre-wired 110V) • 610 CFM air flow • 2ea 20 gal bags • 4" inlet •Castors on base • WT.: 75 lbs

***FREE* With Purchase ($15 Value)**

Dust collection hose • 4" to 3" rigid adaptor • 4" to 2" flex adaptor • Plans for 2 stage setup • Sources for accessories



Item #L40

Wood Lathe XL- 40

Reg $299.95, *On Sale* **$249.95**

Includes ***FREE*** 8 piece Wood Chisel Set ... **$34 Value**

Our new XL-40 Wood Lathe surpasses every lathe in its price range with quality & features you would expect from machines many times its price . FEATURES .....

Heavy Duty cast iron construction provides smooth turning action • **40" Centers • 16" Swing** for turning larger bowls • Smooth toolrest movement on 1" solid steel rails • **"Live" center** on tailstock • **Motor mounted for easy positioning** and belt changes • **Sturdy 52" steel base** mounts on table top or optional stand.

PURCHASE INCLUDES:

• Lathe with Motor & Base • Toolrest • 6" Faceplate • 8 pc wood turning chisel set

SPECIFICATIONS:

- MOTOR: 1720 RPM, 1/2HP, 8AMP, 110V
- 3 Speeds: 660, 1500, 2850 RPM
- Headstock thread - 3/4" x 10 tpi
- Overall length: 60" - Weight : 100lbs

Item **# L40** .....***On Sale*** **$249.95**

(UPS $20)

Lathe Stand

Heavy duty. Wt. 25Lbs

Size: 28"H X 56"L X 21" W

Item **#LST** ..... **$59/ea** (UPS $6)

"MOBILE-K" Air Cleaning System

This new product **removes fine sawdust,** welding smoke, cigarette smoke, paint and oil mist from the air more efficiently than commercial products many times the price.

A remarkable **new patented filter media captures particles as small as .3 microns !** Unit includes filter media on a roll - just pull and advance the roll when a section is dirty - 120' long, good for 60 replacements.

Reg $296.00

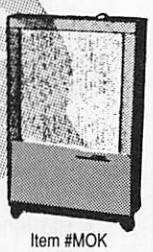
On Sale .. $229.95

(UPS $10)

FEATURES:

• Three speed motor • Castors on base • Steel construction • Size - 10" X 22" X 36" • Wt - 55# • Handles room sizes to 20' X 30' • Made in USA

Replacement filter rolls #MOF..... $45.00 (UPS $3)



Item #MOK

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(•) No charge for accessories ordered with a machine, add $3 if ordered separately.

UPS charges are for Continental U.S. only (Call for shipping charges to other locations)

Letters

Your March/April 1990 issue had a letter (page 7) from a reader looking for wildfowl carving patterns. As a wildfowl woodcarver, I would suggest he send for a brochure from Gordon L. Stiller, 155 Superior Street, Omro, WI 54963, tel. (414) 685-2938. He has patterns for just about any kind of bird.

Bruno Plewa
Chicago, Ill.

I'm looking for a good rubbing varnish. For 30 years I used a Benjamin Moore product called Moorecraft (it was called Dri-Dull for a number of those years), but now they no longer manufacture it. All the modern varnishes I've checked contain vinyls, plastics, or polyurethanes, and those additives don't make for a good hand-rubbed finish. Can you help?

Edwin Greene
Industrial Arts Department Head
Duxbury High School
Duxbury, Mass.

The Wood Finishing Supply Company, 100 Throop Street, Palmyra, NY 14522 sells a product that may interest you. It's called Behlen's 4 Hour Rubbing Varnish and sells for $11.44 per quart plus $3.55 shipping and handling. Order part number B603-27106.

I can't find a source for hot-melt type hide glue, the kind that comes in solid form and must be melted in warm water before it can be used. Can you provide me with a name of a mail-order company that carries this glue?

Ed Joyce
San Antonio, Tex.

Hot-Melt hide glue can be ordered from the Garrett Wade Co., 161 Avenue of the Americas, New York, NY 10013.

I would like to make the Contemporary Candlesticks that were in your January/February 1989 issue, however I have not been able to find a 1/2 in. radius (1 in. diameter) core-box router bit that has a 1/4 in. shank. All that I find have 1/2 in. shanks—and that size won't fit my router.

James L. McDonough
St. Paul, Minn.

If your router only accepts 1/4 in. shank bits, you can substitute a 1/2 in. radius bearing-guided cove bit. Use the same setup shown in Step 3, just locate the bearing so that it is set into the fence and only the 1/2 in. radius is exposed. If not available locally, a 1/2 in. radius bearing-guided cove bit with a 1/4 in. shank can be ordered from MLCS Ltd., P.O. Box 4053JF, Rydal, PA 19046, tel. 1-800-533-9298. It's their part no. 343, currently priced at $15 postage paid.

I enjoyed making the Band-Sawn Napkin Holder project that you featured in your January/February 1990 issue, but I would like to suggest that you caution your readers to check the thickness of

FORSTNER BIT AMAZING OFFER!

Quality, imported Forstner Bits make glass smooth, flat bottom, clean holes, even through veneer, knots and end grain, in any direction. Indispensable for furniture making. Will bore any arc of a circle, make pocket and blind holes and even make overlapping holes for mortising.

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P.O. Box 68666 Indianapolis, IN 46268
Indiana and Connecticut buyers please add sales tax.

their leather before cutting the 1/8 in. wide dado. I ordered the "Half Back" leather from Tandy Leather (the source you suggested in your article), but when I glued the two pieces together, it measured almost 3/16 in. thick. Unfortunately, I'd already cut the dado to a 1/8 in. width, so I had to again set up my router fence to widen the cut.

John Branch
Chicago, Ill.

The half-back we ordered from Tandy measured slightly under 1/8 in. when the two pieces were glued together. However, since leather is a natural material, the half-back thicknesses are likely to vary a bit. Your suggestion is a good one.

I need to order a clock movement and dial face that was sold by the Craft Products Company. They were located in Elmhurst, Illinois, but both letters I recently sent there were returned by the post office. Is Craft Products still in business?

J. Fred Norris
North Tazewell, Va.

The mail-order operation of Craft Products was acquired in 1987 by The American Clockmaker. They carry many of the clock parts and accessories that were found in the Craft Products catalog. For more information, write to The American Clockmaker, P.O. Box 326, Clintonville, WI 54929.

I liked the Shop Tip in your January/February 1990 issue (page 58) which showed how to convert a sawhorse into a small portable workbench. As an improvement, I attached a multi-outlet power strip to one of the legs. Now I don't need to constantly change plugs each time I change power tools. Power strips are sold at most hardware stores and building supply centers.

Jim Ring
Coos Bay, Oreg.

Editor's Note: Harold and Allene Westover have decided to try and spend less time working and more time enjoying their retirement years. Therefore, their company, Westover Workshops, will no longer supply the parts kit for the Folk Harp project featured in our March/April 1988 issue. Readers who wish to make the harp can now order the parts from Folkcraft Instruments, Box 807, Winsted, CT 06098, tel. (203) 379-9857. Folkcraft Instruments will use the same part numbers as Westover Workshops. The current postage paid price is $43 for a package which includes part no. 7 (grommets, tuning pins, strings, and tuning pin wrench), part no. 8A (soundboard), and part no. 8B (back). For a package that includes part no. 9 (book) and part no. 10 (audio tape), the current postage paid price is $19.90. If you prefer to order the parts individually (rather than as a package), you'll need to write to Folkcraft for price and delivery charges.

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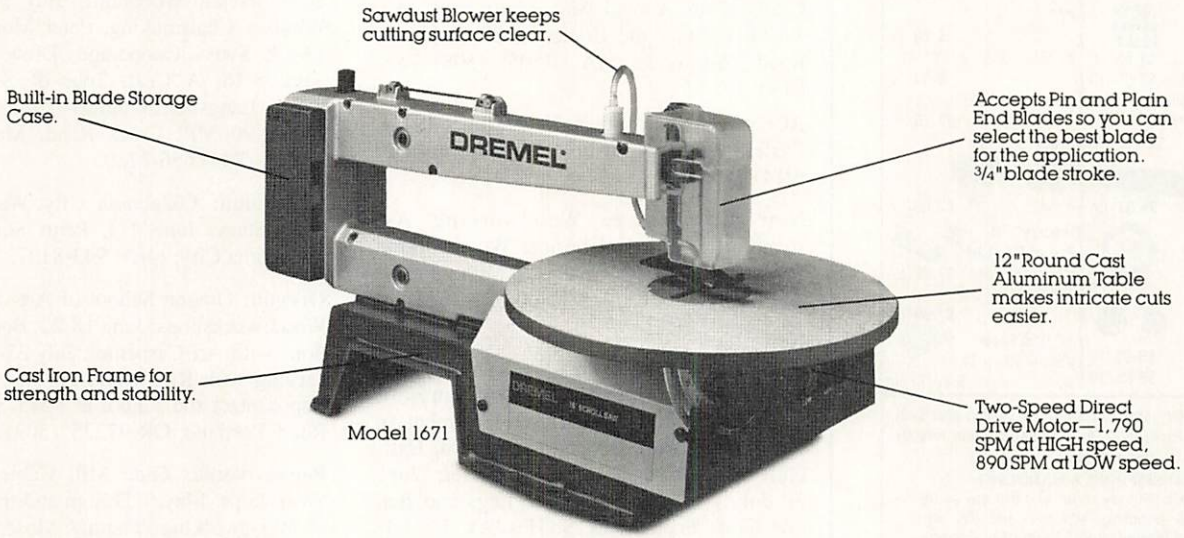
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#8633 Plastic Jar 8" **$3.79**/EA
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#LC6 6" **$2.29**/EA

Clipboard Clips

#L5 3" . . . . . **$.62**/EA
#ST6 6" . . . . . **$.95**/EA

Saw Tooth Hangers

#S59 1-5/8" . **$4.17**/100

Black Hammer Hinge w/Screws

#1730 . . . . . **$1.62**/2 . . . . . **$7.17**/10

Brass Plated Hinges

#910 1" **$1.65**/10
#928 1-1/2" . . **$2.59**/10
Screws for above
#F125 #5 Fl. Hd. **$2.75**/100

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Plastic Spoke Wheel 4"

#1741 . . . . . **$.90**/EA

Metal Wheels

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#7226 3-1/2" . . **$2.00**/10 . . . . . **$15.00**/100
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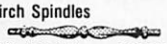
#7227 1-3/4" . . **$1.10**/10 . . . . . **$7.60**/100

Birch Spindles



#S6 5-3/4" . . . . **$.69**/EA
#S85 9" . . . . . **$.99**/EA

Galley Spindles

#S1 Birch 1-1/8" . . . . . **$1.65**/10 . . . . . **$10.00**/100
#S4 Birch 1-1/2" . . . . . **$1.70**/10 . . . . . **$15.60**/100
#S10AK Oak 1-1/8" . . . . . **$1.50**/10 . . . . . **$12.00**/100
#S10AK Oak 1-1/2" . . . . . **$2.40**/10 . . . . . **$22.00**/100

Lamp Socket

#940 Push Thru . **$1.65**/EA
#941 Turn Knob . **$1.95**/EA

Animal Eyes

#8681 1-1/8" . . **$3.50**/20
#8682 1-1/2" . . **$4.00**/20

Chair Back Spindle 21"

#8147 Spindle . . **$2.35**/EA

Metal Pails 2-1/4"

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#7380 1"×3/8" . . . . . **$.79**/10
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#7461 3"×3/8" **$3.75**/10

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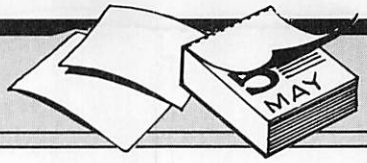

Events

We will gladly list as many events of interest to woodworkers as space permits. Listings are free and may include shows, fairs, competitions, workshops and demonstrations. The deadline is eight weeks before publication, May 4 for the July/August issue. Please address announcements to the Events Department. Readers planning on attending events should call ahead if possible. Scheduled dates and locations sometimes change between publication and the date of the event.

California: The Woodworking Shows, Sacramento, May 4-6, California Expo and State Fair; So. California, May 11-13, Pasadena Convention Center; 1-800-826-8257.

College of the Redwoods, Fine Woodworking Program: June 4-15, Basic Carving, Robert Fowler; June 25–July 13, Tools & Techniques, Jim Budlong; July 23–Aug. 10, Tools & Techniques, Michael Burns; July 21-22, Weekend Seminar, James Krenov. The Ninth Annual College of the Redwoods Furniture Show, May 19–June 3, Highlight Gallery, 45052 Main St., Mendicino. Contact the college at 440 Alger St., Fort Bragg, CA 95437; (707) 964-7056.

Connecticut: Brookfield Craft Center Workshops: June 30–July 1, Woodturning, Rude Osolnik; July 9-13, Cedar and Canvas Canoe Making, Horace Strong. Contact the center at P.O. Box 122, 286 Whisconier Road, Brookfield, CT 06804; (203) 775-4526.

Brookfield/SONO Craft Center, Shaker Style Furniture Exhibit, May 5–June 24, Ian Ingersoll one-man show. Contact the center at 127 Washington St., South Norwalk, CT 06854; (203) 775-4526.

Georgia: ACC Craft Fair Atlanta, A Salute to American Crafts, May 4-6, Atlanta Apparel Mart, Atlanta; 1-800-836-3470.

Massachusetts: The Worcester Center for Crafts, 20th Annual May Craft Fair, May 18-20. Contact the Center at 25 Sagamore Road, Worcester, MA 01605; (508) 753-8183.

ACC Craft Fair Springfield, June 19-24, Eastern States Exposition, West Springfield; (914) 255-0039.

New Hampshire: Woodworking Association of North America: Woodworking Retreat, July 22-26, Waterville Valley Resort and Conference Center; 1-800-521-7623.

New Jersey: Peters Valley Craft Center, Summer Woodworking Workshops: June 9-10, Using the Hand Plane, David Van Hoff; June 16-17, Painted Surface Treatment in Furniture, Robert Dodge; June 23-24, Half-Hull Model Making, Ken Basset; June 30–July 1, Carving Cabriole Legs and Ball and Claw Feet, Mack S. Headley, Jr.; July 6-11, Cabinetmaking, David Van Hoff; July 14-18, Cedar Canvas Canoe Building, Horace W. Strong; July 20-22, Hand Carved Signs, Ray Halacy; Aug. 3-7, Making and Using Wooden Planes, David Finck; Aug. 10-12, Gilding, June Fette; Aug. 15-21, 18th Century Chairmaking, Eugene E. Landon; Aug. 24-31, Making an Acoustic Guitar, Dick Boak. Contact the center at Layton, NJ 07851; (201) 948-5200.

South Jersey Wood Carvers, 11th Annual Woodcarving Show, June 2-3, 10 a.m. to 5 p.m., Wheaton Village Glass Museum, Millville; (609) 829-8731.

New York: Sagamore Lodge and Conference Center, Weekend Woodcarving Workshops with Rick Butz, July 13-15 and Aug. 17-19. Contact the center at Racquette Lake, NY 13436; (315) 354-5311.

American Craft at the Armory, May 11-13, Seventh Regiment Armory, New York City; 1-800-836-3470.

North Carolina: Penland School, Wood Classes: May 14-25, Dynamic Objects, Paul Sasso; May 28–June 8, Wood Carving and Shaping, Peter Pierobon; June 11-22, Furniture Design, Phillip Tennant; June 25–July 6, Woodworking, C.R. "Skip" Johnson; July 9-20, Furniture from the Source, Brad Smith; July 23–Aug. 8, Furniture, Lauren McDermott; Aug. 13-24, Design in Wood, Leo Doyle. Penland School, Penland, NC 28765; (704) 765-2359.

Country Workshops, 1990 Classes: June 25-30, Ladderback Chairmaking, Dan Mayner; July 9-13, Scandinavian Woodcraft, Wille Sundqvist; July 16-20, Advanced Scandinavian Woodcraft; July 30–Aug. 4, Windsor Chairmaking, Peter Murkett; Aug. 13-18, Swiss Cooperage, Drew Langsner; Sept. 8-16, A Craft Tour of Switzerland, Drew Langsner. Contact Country Workshops, 90 Mill Creek Road, Marshall NC 28743; (704) 656-2280.

Oklahoma: Oklahoma City Woodcarvers' Club Show, June 1-3, Penn Square Mall, Oklahoma City; (405) 943-8107.

Oregon: Oregon School of Arts and Crafts, Wood Workshops: June 18-22, Bent Laminations with Art Carpenter; July 23-27, Woodcarving with Rick Butz. For more information contact the school at 8245 SW Barnes Road, Portland, OR 97225; (503) 297-5544.

Pennsylvania: Olde Mill Cabinet Shoppe Workshops: May 5, Design and the Business of Woodworking, Thomas Moser; May 19-20, The Tuning, Care and Use of Old Tools, Mike Dunbar; June 2-3, Woodfinishing, George Frank; June 23, Bleaching Procedures and Chemical Finishing, Prew Savoy. For more information contact the shop at 1660 Camp Betty Washington Road, York, PA 17402; (717) 755-8884.

Cabinetmakers' Supplies

Hardware Suppliers

As a service to our readers, ***The Woodworker's Journal*** periodically lists sources of supply for various products. In this issue we've included suppliers of specialty hardware.

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Ball & Ball Co.
463 West Lincoln Highway
Exton, PA 19341
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A Carolina Craftsman
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Anaheim, CA 92805
Catalog $2.00 refundable on first order

18th Century Hardware Co., Inc.
131 East Third St., Dept. WWJ
Derry, PA 15627
Catalog $3.00

Elwick Supply Co.
230 Woods Lane 717-B
Somerdale, NJ 08083
Catalog Free

Horton Brasses
Nooks Hill Road, P.O. Box 120WJ
Cromwell, CT 06416
Catalog $3.00

Lee Valley Tools Ltd.
1080 Morrison Drive, Dept. WJ
Ottawa, ON, Canada K2H 8K7
Catalog $5.00

Paxton Hardware Ltd.
P.O. Box 256, WJE
Upper Falls, MD 21156
Catalog $4.00

Period Furniture Hardware Co.
123 Charles St., Dept. WJ
Box 314 Charles St. Station
Boston, MA 02114
Catalog $5.00

Renovator's Supply
6254 Renovator's Old Mill
Millers Falls, MA 01349
Newsletter $3.00/year

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Arabi, LA 70032
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Woodbury, CT 06798
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Woodworker's Supply of Nevada
(formerly Imported European Hardware)
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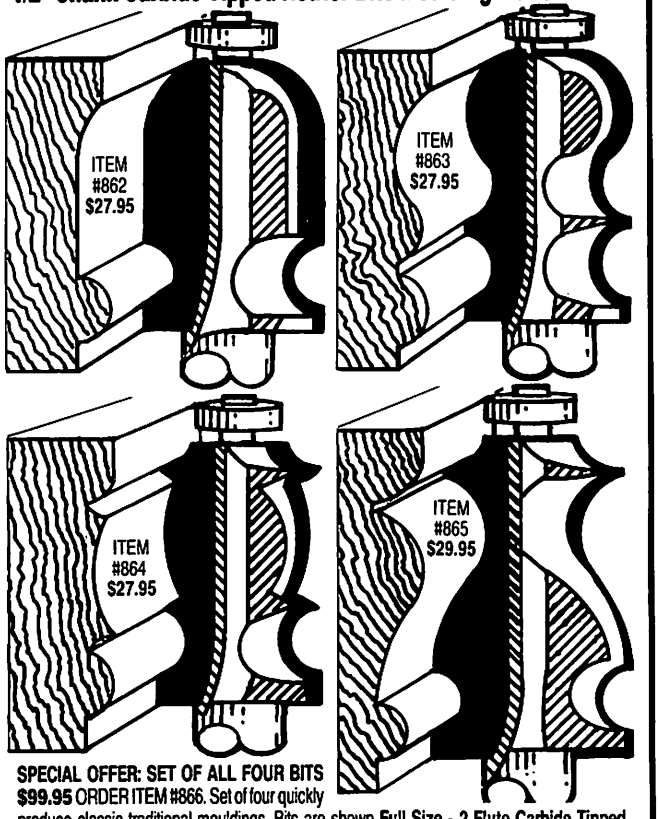
Las Vegas, NV 89118
Catalog $1.00

1/2" Shank Carbide-Tipped Router Bits Moulding Plane Profiles



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1 x 42	.69 ea	3 x 27	.83 ea
1 x 44	.69 ea	4 x 21¾	.91 ea
2½ x 16	.73 ea	4 x 24	.94 ea
3 x 18	.74 ea	4 x 36	1.14 ea
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3 x 23¾	.80 ea	2¼ x 80	2.47 ea

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180-A thru 400-A	$10/pk	$18/pk

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Solid Carbide Spiral — 2 Flutes

1/4" SHANK

Part No.	DIA.	C.L.	O.L.	PRICE
C1441	1/8"	3/8"	2"	$15
C1442	3/16"	5/8"	2"	$15
C1454	7/32"	3/4"	2"	$19
C1443	1/4"	7/8"	2"	$15

1/2" SHANK

Part No.	DIA.	C.L.	O.L.	PRICE
C1446	3/8"	1"	3"	$30
C1447	1/2"	1 1/2"	3"	$30

Due to the nature of Solid Carbide, these bits are not warranteed against breakage.

MADE IN U.S.A.

Straight — Single Flute

1/4" SHANK

Part No.	DIA.	C.L.	O.L.	PRICE
C1471	1/8"	3/8"	1 3/4"	$12
C1472	5/32"	3/8"	1 3/4"	$12
C1473	3/16"	3/8"	1 3/4"	$12

Due to the nature of Solid Carbide, these bits are not warranteed against breakage.

If you haven't used Solid Carbide you're missing out.

Solid Carbide Tip

Solid Carbide Straight — 2 Flutes

1/4" SHANK

Part No.	DIA.	C.L.	O.L.	PRICE
C1450	1/8"	3/8"	2"	$15
C1452	1/4"	3/4"	2"	$15

Due to the nature of Solid Carbide, these bits are not warranteed against breakage.

HSS (Cobalt) Roundnose — 2 Flutes

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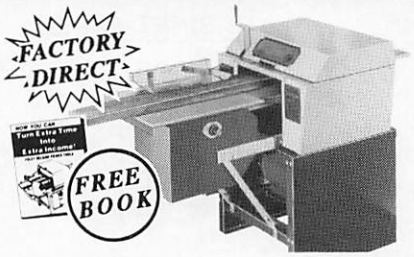

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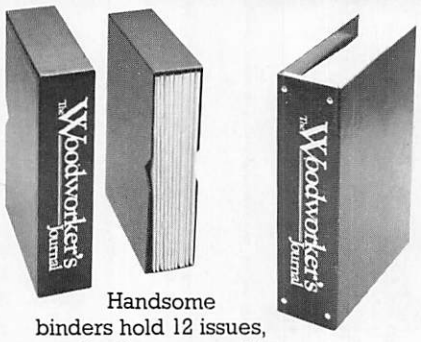

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I am restoring two Stanley planes, a no. 45 and a no. 55. Anyone having broken or rusted planes, or extra parts or accessories please contact me.

Wally Hatlestad
23518 Evalyn Ave.
Torrance, CA 90505

I need a timing belt for a Rockwood 10 in. radial-arm saw, model no. AS 1086, made in Taiwan in 1986.

Clyde D. Hensley
Box 930 Rt 2, Rideway, VA 24148

I need any information I can get on a 16 in. Walker Turner band saw, model no. BM 1135.

Daniel W. Santos
24 Peace St., Warwick, RI 02888

I have a 20 in. band saw identified only as being made by CH & E Engineering of Milwaukee, Wisconsin. I'd appreciate any information.

Dennis Preston
15 Prospect Drive
Brookfield, CT 06804

I need an owner's manual for a Shop Master 14 in. jigsaw, about 25 years old, model no. RA 1151.

Bert Croken
10 RD 2397, Aztec, NM 87410

I need an owner's manual and parts list for a Craftsman (King-Seeley) jigsaw, model no. 103.20770.

John W. Blue
1404 E. Prairie, Decatur, IL 62521

I need an owner's manual and parts list for a 12 in. Walker Turner band saw, serial no. 785.6390.

Joseph Kawczynski
436 Michael Road
Orchard Park, NY 14127

Product News

To keep our readers up-to-date, this column features brief descriptions of new tools and supplies on the market. The product descriptions are provided by the manufacturer and are not a result of tests or reviews by the editors of ***The Woodworker's Journal.***

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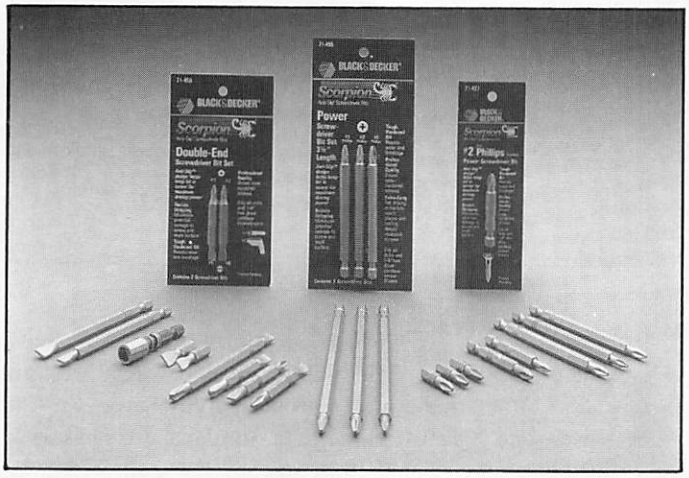
The Parks Corporation has developed a new line of water soluble wood finishes that are non-toxic when dry, nonflammable and don't have harsh solvent vapors. The Safe & Simple finishes dry faster, and are harder and clearer than conventional varnishes and lacquers. Clean up is with soap and water. For more information contact Parks Corporation, P.O. Box 5, Somerset, MA 02726; 1-800-674-8404.



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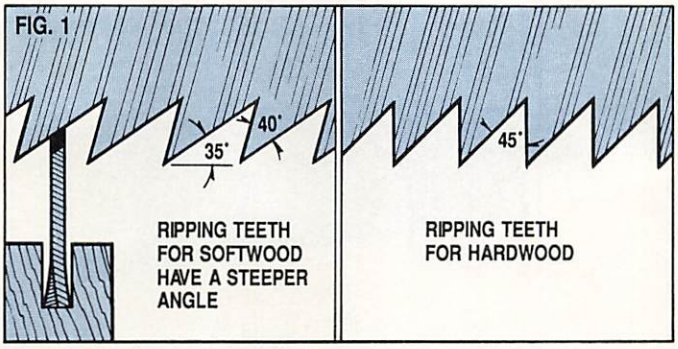
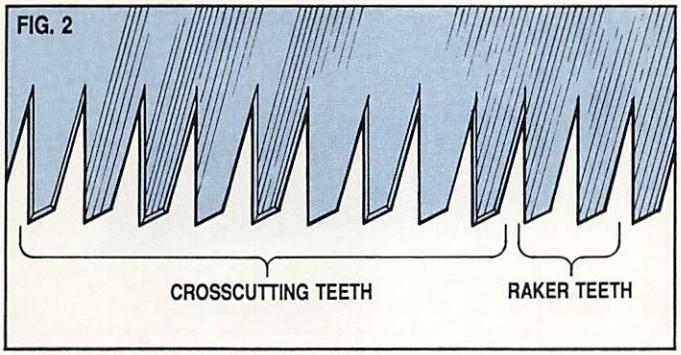
Japanese Saws:

Eastern-Style Saws Win Converts

There are several obvious differences between Western saws—the traditional European-style saws we all use—and Japanese saws. First, the Japanese saws look very different, and second, they cut on the pull stroke as opposed to the push stroke. But once you understand how they cut, the look makes sense.

Anyone who has used a Western saw knows the problems inherent in the saw's design. The teeth are angled away from the user. As the blade is pushed through the wood, you must be very careful to guide it straight, lest the blade bend and kink. Also, unless the saw has a separate spine, as in a backsaw, the blade must be quite thick to resist this tendency to bend or kink.





By contrast, the Japanese saw cuts on the pull stroke with teeth angled toward the user. This means the blade can be made very thin. The thinner the kerf and the smaller the area of wood being removed, the less the effort required to remove that wood. Cutting on the pull stroke also gives the user greater control and better accuracy. Even when using a Western-style saw, it's mandatory to make a starting kerf by drawing the saw across the wood toward the body. Trying to make a starting kerf by pushing the blade always risks gouging the edge.

An easy way to illustrate why the pull stroke lends greater control and accuracy is to take a long, thin piece of steel and try to push it through water from the end. Unless the steel is guided perfectly, the slightest deviation forces it to waver from its intended path. But pull the steel through the water and it follows your hand in a perfect straight line. The same principle can be illustrated with a piece of paper in the air.

Japanese saws have another advantage. Because the blades are under tension as they're pulled through a cut, the steel can be tempered to a greater hardness. Western saw blades, because they will inevitably be bent, must use steel that's ductile in order to lend the required flexibility. If this property were not included, then the saw might shatter the first time it catches and binds. But making the steel ductile reduces its hardness, which also means the teeth won't stay sharp as long.

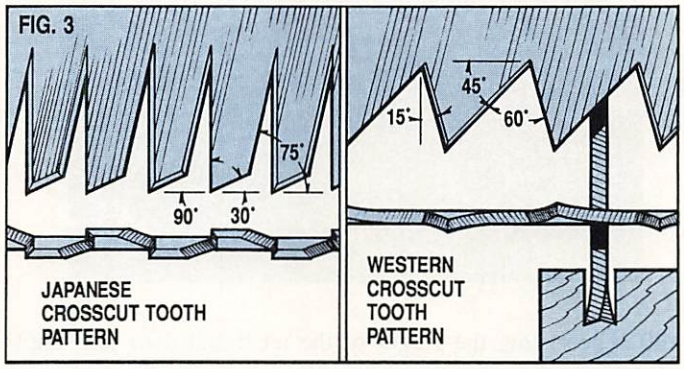
Although Japanese saws look much lighter than their Western counterparts, the look is attributed to efficient design, not lack of quality. The blades are thin because a thin blade cuts quicker and with less effort. Even the straight handle of the Japanese saws makes sense. It's the most natural position for the hand to be in as it is pulling.

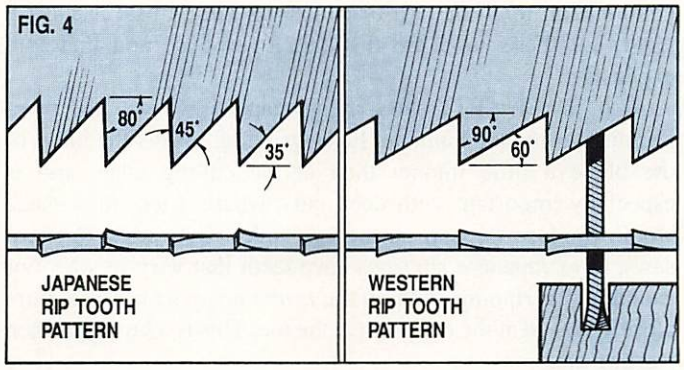
Western vs. Japanese Teeth

Like their Western counterparts there is a Japanese saw for just about every kind of cut. There are saws for making ripping cuts and there are saws for making crosscuts. But the number of teeth and the way that they are sharpened and set depends both on the type of cut being made and on the variety of wood being cut.

Ripping teeth for softwoods have a steeper angle than for hardwoods (Fig. 1), and some saws use a tooth configuration that includes crosscutting and raker teeth (Fig. 2). The raker teeth clear sawdust from the kerf. As a further wrinkle, some Japanese saws feature a curved blade. This insures that with difficult woods some teeth are always cutting. A curved blade is also useful for tenon work, where with a straight blade it's easy to cut past the line at the edge.

A simple comparison of Japanese crosscutting and ripping teeth to their Western counterparts shows that the main differences in teeth are in those for crosscutting (Fig. 3). The Japanese crosscut teeth are bevel-cut, almost like tiny knives. A secondary bevel at the point of the tooth produces an even smoother shearing action as the wood fibers are severed. Japanese and Western rip teeth are similar, with the main





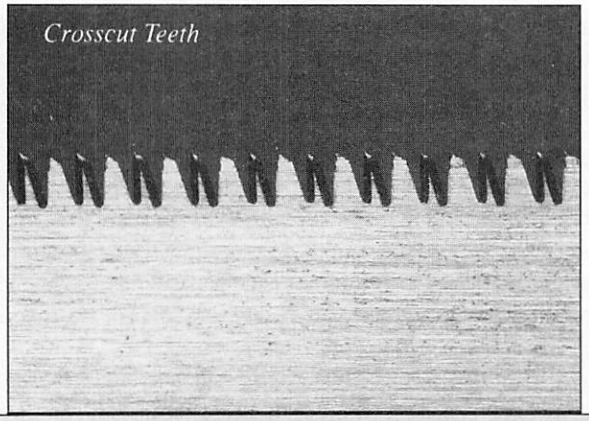
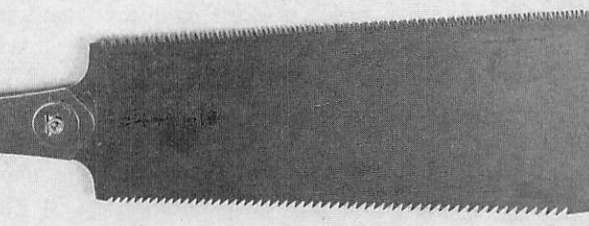


Photo 1: Ryoba Nokogiri



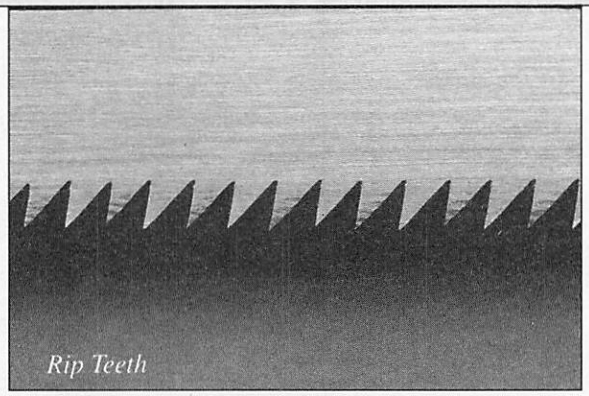


Photo 2: Kataba Nokogiri

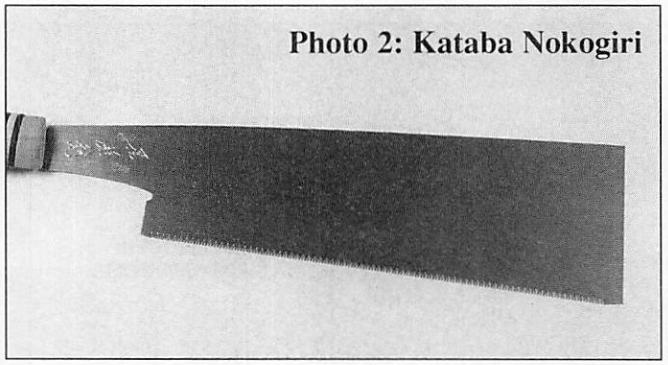
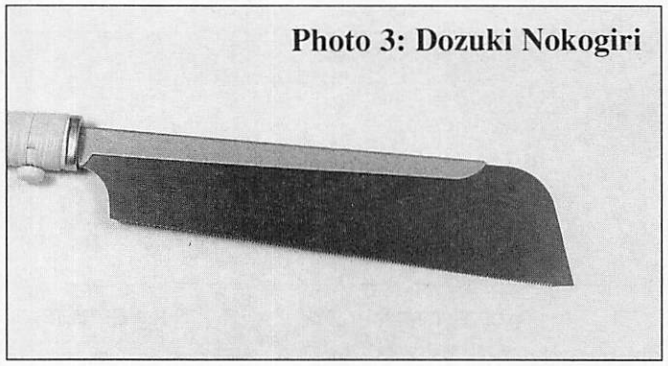


Photo 3: Dozuki Nokogiri



difference being the length of the teeth and their rake angle (Fig. 4). Some specialty saws, such as those for plywood, use a combination tooth pattern that includes both crosscut and rip teeth, but these saws are difficult to produce and therefore expensive.

Also like Western saws, many Japanese saws use taper grinding to reduce binding. Taper grinding makes the body of the blade a little thinner than at the cutting edge, and is especially important with deep cuts, where a too-thick blade would produce friction on the kerf sides. But unlike Western saws, most Japanese rip saws have teeth that vary in size. For example, the ripping teeth on the *ryoba nokogiri* saw are more closely spaced at the heel than at the toe. This is a big help when starting cuts.

Choices

There are five basic types of Japanese saws that are useful for woodworking. As Occidental woodworkers discover how useful Japanese saws are, though, we can expect to see more models manufactured specifically for market in the West.

Ryoba Nokogiri (Photo 1): The double-edged *ryoba nokogiri* saw is the most popular Japanese saw. Blade lengths can range from about 8 in. to over 14 in., but most of these saws used for woodworking don't exceed about 11 in. As shown in the photo, one edge of the blade is ground for ripping, the other for crosscut work. The blades are wider at the toe than at the heel, and although the saw blade is taper-ground so that it's thinner at the center, the thickness and tooth set of both blades are equal. Because of this, for very deep cuts, the teeth of the opposite blade may nick the sides of the kerf.

Unlike Western saws, the larger the Japanese saw, the coarser the teeth. Comparing three popular sizes of *ryoba nokogiri* illustrates this point. A saw with an $8\frac{1}{4}$ in. long blade has 10 rip and 20 crosscut teeth per inch, while a $9\frac{1}{2}$ in. blade has 7 rip and 16 crosscut teeth per inch, and a $10\frac{3}{4}$ in. blade has 6 rip and 11 crosscut teeth per inch. When buying Japanese saws, a general rule of thumb is the smaller the blade, the finer the teeth.

Kataba Nokogiri (Photo 2): This saw is really just a single edge version of the *ryoba nokogiri*. It allows deep cuts without any interference from the trailing blade. *Kataba nokogiri* saws are made in both crosscut *(yokobiki)* and rip *(tatebiki)* versions.

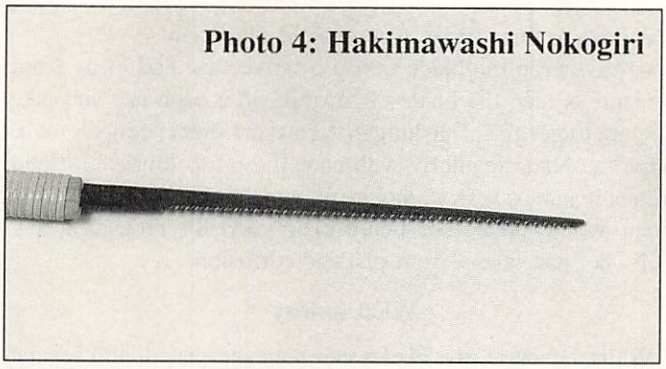


Photo 4: Hakimawashi Nokogiri

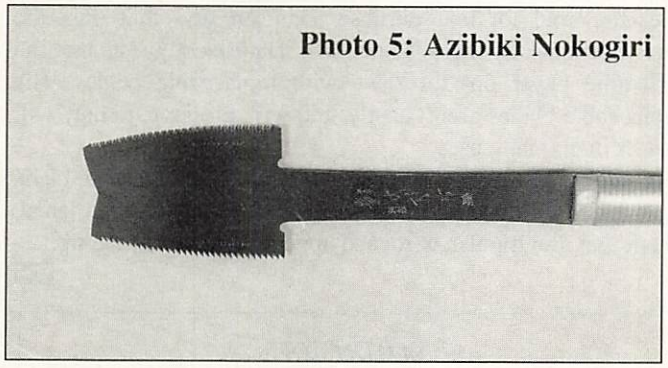


Photo 5: Azibiki Nokogiri

Dozuki Nokogiri (Photo 3): The *dozuki* is the equivalent of a Western backsaw. Although the literal translation of *dozuki* is "tenon shoulder," Westerners have found that these saws are also excellent for cutting dovetails. For this reason a shorter version of the standard *dozuki* is marketed as a dovetail saw. The exceedingly fine blades require the rigid back to lend them some support. Some *dozuki* saws have a rigid spine that extends the full length of the blade, while in others the blade extends past the spine. This latter feature is useful for those instances where the spine would be in the way as a deep notch or dovetail is cut. *Dozuki* saws have different tooth configurations, including rip, crosscut, and combination. The number of teeth per inch vary from 18 to as high as 28.

Hakimawashi Nokogiri (Photo 4): This is the equivalent of our keyhole saws. But the Japanese version cuts faster, and since the cut is made on the pull stroke, there's no kinking as with the Western keyhole saw. Typical blade length is 8 in. with 12 teeth per inch.

Azibiki Nokogiri (Photo 5): Although its blade resembles the Western veneer saw, the original purpose of this Japanese saw was to cut large mortises and grooves in the middle of a panel. Blades have crosscut teeth on one side and rip teeth on the other. This saw is also useful for cutting blind sliding dovetails, and for work in tight or restricted areas.

These are the Japanese saws which seem most useful for woodworking. There are other saws that can be used for woodworking, but they are more specialized, or are intended mainly for carpentry and timber-framing. Some of the specialized saws that have woodworking applications are the *kugihiki* or flush-cutting saw, which has teeth without any set so it won't scratch a surface as pegs or tenons are trimmed, and the *anahiki,* a saw with large teeth and a slightly curved blade that's used for making rough cuts (both rip and crosscut) or sizing stock. *Anahiki* saws are sold in both *ryoba* (double blade) and *kataba* (single blade) versions.

How They Are Used

Fred Damsen, owner of The Japan Woodworker, in Alameda, California, cautions that before using Japanese saws it's best to discard your preformed notions of what a saw is, how it should look and how it works. According to Damsen, the biggest problem with people accepting Japanese saws is that all their lives they've been conditioned to think that a saw only looks and performs one way. "From the time you were a kid in your father's shop, you had a picture in your mind of what a saw is," Damsen said.

Damsen, who has been selling Japanese tools for close to 20 years, points out that in some respects people master Japanese saws easier if they aren't used to using Western saws. But he is quick to add that the only way to judge their value for yourself is to try one.

Start with a light touch, applying almost no downward force. Guide the tool as you pull it through the wood, letting the saw do the work. The most common grips are two hands on the blade when using the larger *ryoba* saws, and one hand on the blade when using the smaller saws like the *dozuki.* Extending the index finger along the top of the handle seems the most natural position when using one hand. You can try different hand positions or grips until you find one you are comfortable with. Although the Japanese work close to the floor, often in a seated or squatting position, there's no reason why you can't work at a sawhorse or workbench height that you are comfortable with.

To start a cut with a saw that has large teeth, use your thumbnail or a block of wood as a guide and take several short strokes. With the fine-tooth crosscutting saws a guide isn't usually needed. The teeth are so sharp they bite right into the wood, even when the saw is angled, as in cutting dovetails. With a ripping blade that has the teeth at the heel more closely spaced than at the toe, use the heel area of the blade to make your starting cut.

Once you get comfortable with cutting on the pull stroke, you'll discover other advantages to using Japanese saws. The biggest plus is the ease with which the tools cut, but a close second is the accuracy that the pull stroke and thin kerf allow. When it comes to cutting right on the pencil line, a kerf only as wide as the line results in joints that fit tight the first time, no paring or adjustment needed. And joints that fit tight the first time not only look good, but also save time. Even if you've

Japanese Influence Spreads

The growing popularity of Japanese saws has not escaped the interest of American toolmakers. A new handsaw from The Stanley Works in New Britain, Connecticut, is their Shortcut. Stanley says the saw, which cuts on both the pull and push strokes, cuts 30 percent faster than conventional handsaws. The main reason for the increased cutting efficiency is the teeth, which have three cutting bevels on each tooth, very similar to the teeth on Japanese saws.

Theresa Loughran, Marketing Manager for Saws at Stanley, says the Shortcut is just the top of the iceberg though. "In 7–10 years we predict that every saw sold will have this new tooth design." Loughran added that U.S. sawmakers refer to the tooth pattern as "aggressive tooth" design. Loughran noted that although the Shortcut was first made with blades imported from Japan, the blades are now manufactured in the company's New Britain, Connecticut plant. "We're having trouble keeping the saws in stock, and we're running 24 hours around the clock," Loughran said.

As for Stanley's plans, "By 1993 our specialty saws and hand saws will all be converted to the aggressive tooth design," Loughran said. Responding to the problem of re-educating the public on what a saw should be, Loughran said that Stanley also has an aggressive marketing strategy, including in-store demonstrations and a 15-day money-back offer to get people to try the new saws.

The Japanese also make a saw that cuts on the push stroke. It's sold by Garret Wade (see Sources). Garrett Wade says that this Western-style saw with Japanese pattern teeth cuts 35 percent faster than a comparable Western tooth pattern saw.

never cut dovetails before, try cutting a sample dovetail joint using a *dozuki* and chances are you'll be pleasantly surprised with the result.

The thin blades and hard steel that make Japanese saws so effective also make them vulnerable to damage. Take care not to bang a blade against another tool or you could loose a number of teeth. Occasionally a few teeth may break off in use, but this usually won't affect the saw's performance. If you are working in abrasive tropical hardwoods such as teak, use only blades that have impulse hardened teeth. Teak is especially rough on the cutting edges of both Japanese and Western saws. Impulse hardening—where a high-frequency electric current is passed through the blade—produces teeth that typically stay sharp two to three times as long as regular teeth.

Always keep the blade in a protective case and away from moisture. Clean the blade of sawdust after each use and take care not to get glue, finishing materials or other chemicals on it. Wipe the blade regularly with camellia oil to lubricate it and protect it against rust. Camellia oil, which is available from The Japan Woodworker (see Sources) is good for protecting any tool—not just saws—from rust and corrosion.

What to Buy

While Japanese saw blades can be resharpened, and special files are sold for that purpose, Damsen says that only the serious enthusiast sharpens his own. Damsen suggests that the first-time buyer opt for saws with replaceable blades. The replaceable blades aren't costly, and with proper care they will last through many uses.

There's one more advantage to buying the replaceable blade style of saw. Most replaceable blades are impulse-hardened. Teeth that are impulse hardened appear darkened at the tip.

SOURCES

Tool Suppliers

The Japan Woodworker
1731 Clement Ave., Alameda, CA 94501
Tel. (415) 521-1810

Garrett Wade
161 Avenue of the Americas, New York, NY 10013
Tel. 800-221-2942

Woodcraft
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Books

Japanese Woodworking Tools: Their Tradition, Spirit and Use by Toshio Odate; published by The Taunton Press.

Japanese Woodworking Tools by Henry Lanz; published by Sterling Publishing Co., Inc.

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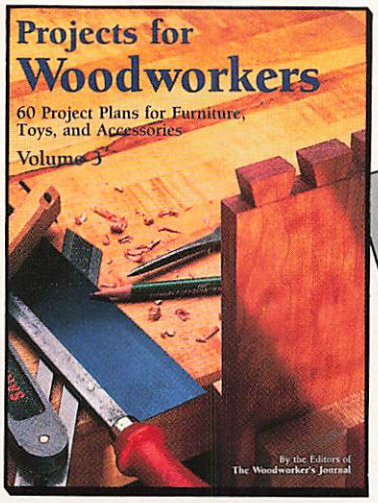
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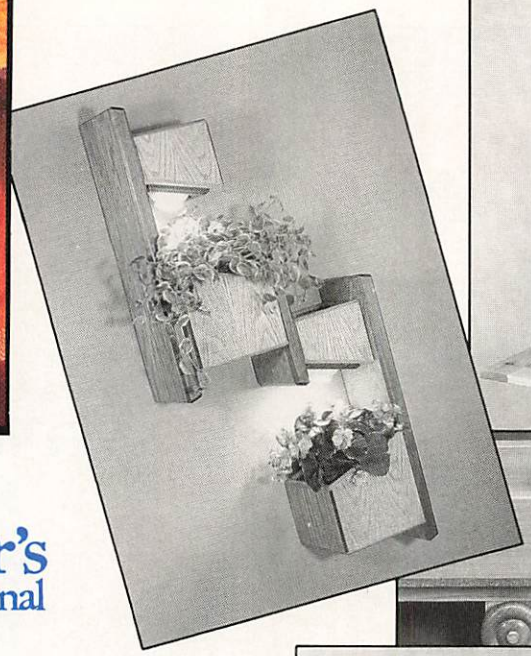

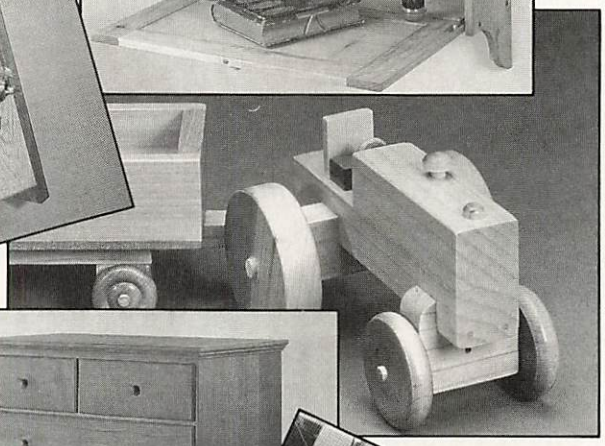

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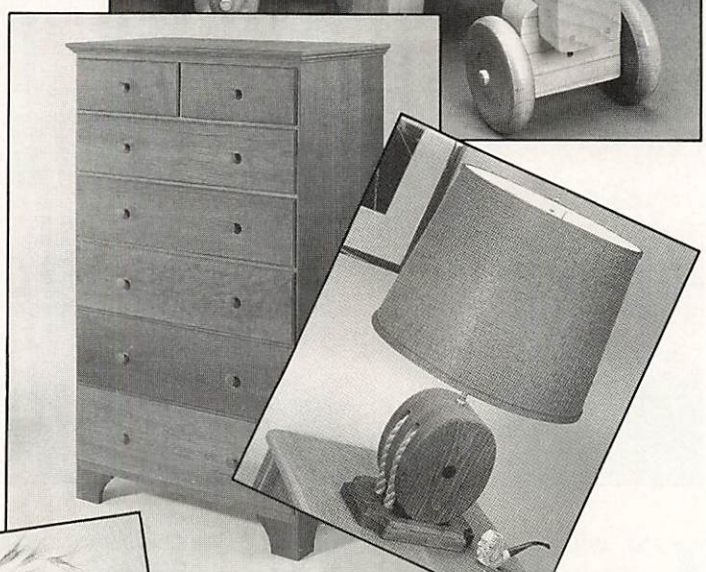

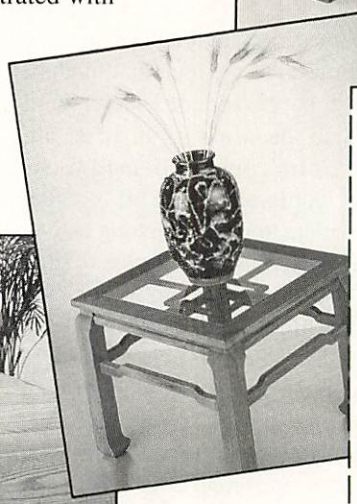

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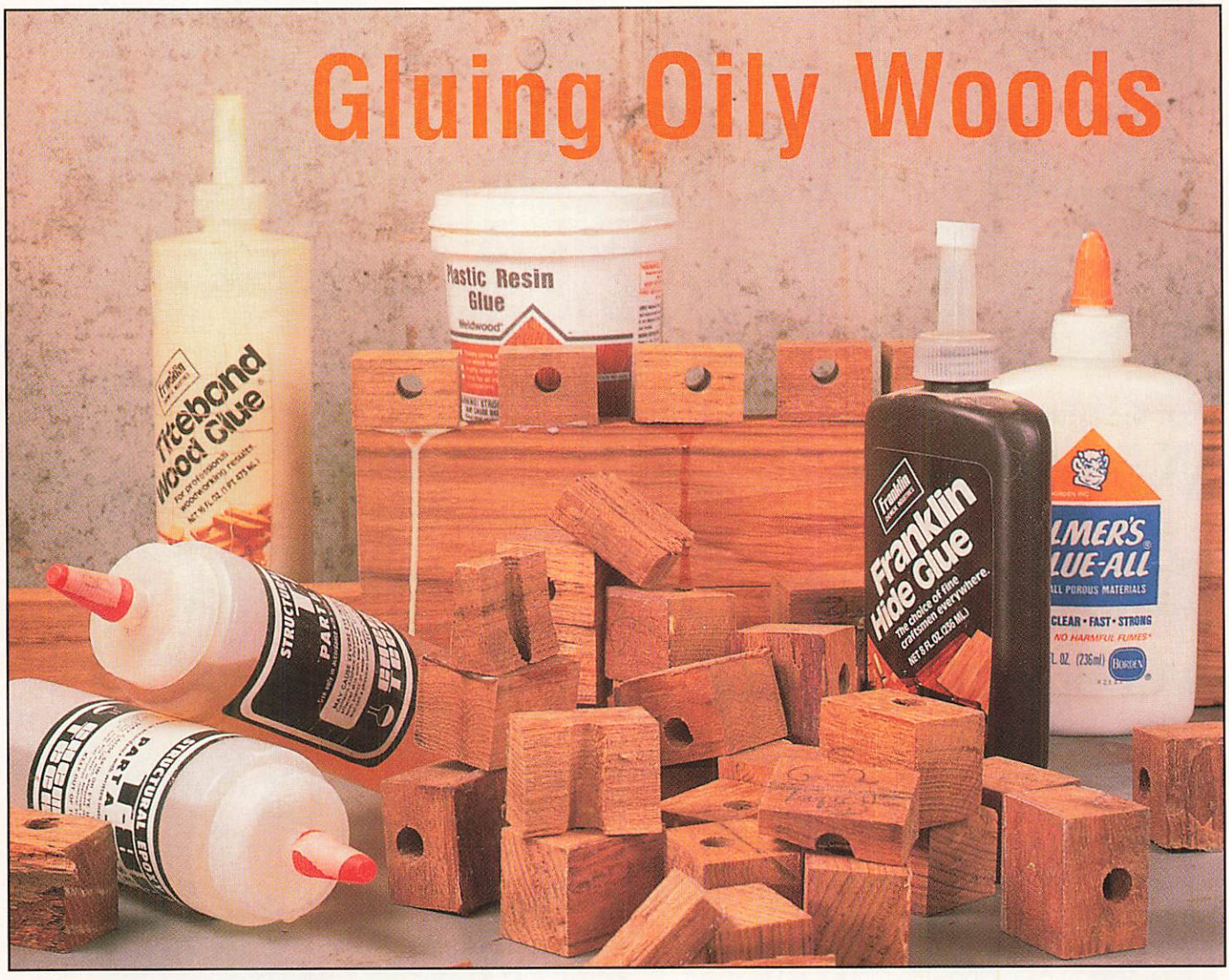
Gluing Oily Woods



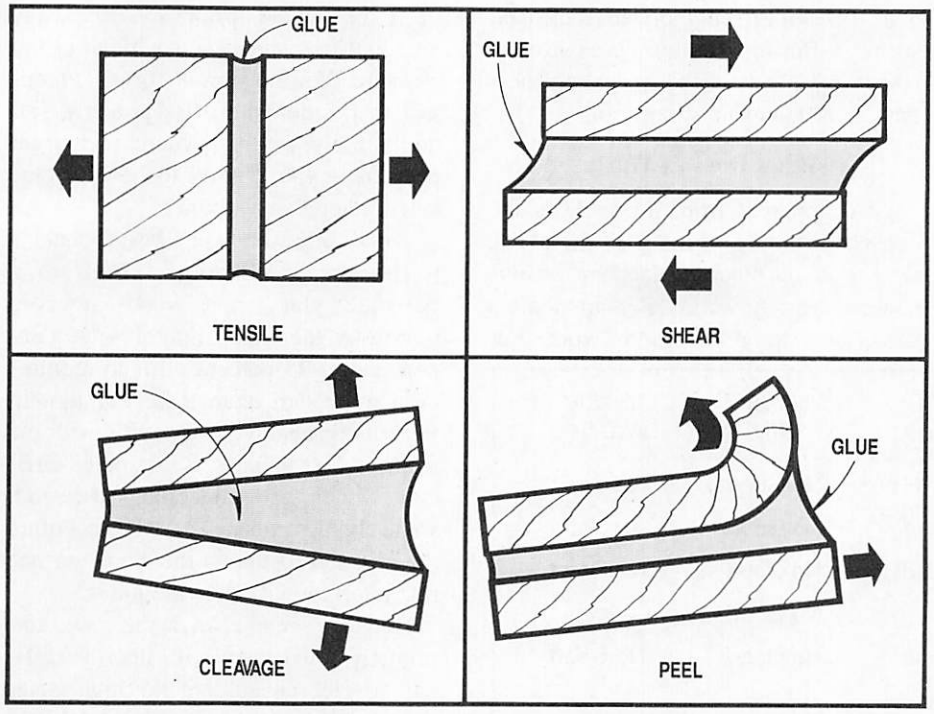
Gluing oily and dense tropical hardwoods can be difficult. We discovered this first-hand when teak panels for the English Planter Box on page 43 split in half before we could set them in their frames. The unexpected event was especially surprising because we'd called the glue company to make sure their product was recommended for teak and asked for instructions on any special precautions needed.

The glue we first used was plastic resin, which the manufacturer assured us worked well with oily woods. And when we did the glue-up, we followed the usual recommendation to glue freshly jointed surfaces. We left the panels in clamps over the weekend, so we were surprised on Monday to discover the joints separating along the glue line.

We were used to the idea that modern glues are reliable and provide a joint stronger than the wood itself. After all, for most North American hardwoods almost any common woodworking glue will do a satisfactory job, as long as you follow the directions. The choice of glue generally hinges on matters other than whether the glue will actually hold the parts together. A glue choice might depend on such factors as whether you require a long or short assembly time, whether you need gap-filling qualities or whether the furniture will be used indoors or out. But for oily tropical hardwoods, those considerations must be secondary to the primary concern of getting a glue joint that works. The oils and resins in many tropical hardwoods interfere with the joint by preventing the chemical bond of the glue to the wood surface.

Which Glue to Use

The unsettling experience prompted us to consult a number of sources for information on gluing oily woods in general and teak in particular. That search was a bit unsettling as well, because the information we came up with was contradictory. According to one source, you can use nearly any glue. The important factor is working with freshly jointed stock because it takes time for the oil to migrate to the surface. Several sources said it's best to wash the surface with acetone or lacquer thinner



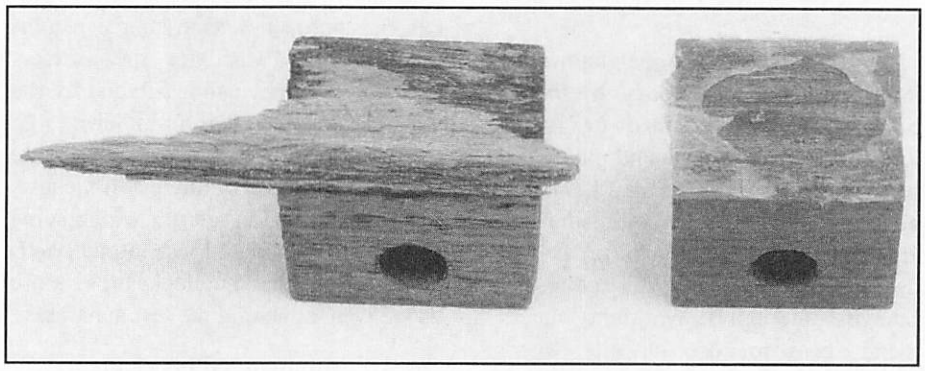
FOUR WAYS TO MEASURE GLUE STRENGTH

to remove the oils. One said use casein glue, another said use hide glue or a synthetic resin, yet another said use a specially formulated epoxy, and still another advocated using resorcinol.

Well, for our teak planter we could at least narrow the choices because of the outdoor use. We needed to use either the special epoxy or the resorcinol, two glues that are truly waterproof. We'd already eliminated the plastic resin, often used for outdoor furniture even though it's not perfectly waterproof. We went with T-88 Epoxy. It's specially formulated for difficult and oily woods; it's used for gluing teak in boatbuilding, and it doesn't leave the red glue line characteristic of the resorcinol.

But, somewhat wiser for our last failure, we tested the T-88 Epoxy before gluing the panels again. The test worked, but it still left us with many unanswered questions. What is the proper surface preparation? Does the glue need a freshly jointed surface to work properly? Does it help to wash the surface with lacquer thinner? Of the many glues mentioned, which really are effective?

So we decided to do more tests, using the recommended glues on freshly jointed surfaces, on surfaces washed with lacquer thinner and on surfaces left alone for five days after jointing. We also tested both dull and freshly sharpened jointer knives. (Surprisingly, the sharpness didn't make a difference. But our definition of sharpness may not be accurate. Certainly at some point knives will get so dull that they will make it impossible to get a good glue joint.)



A good glue joint (left) and a failed glue joint.

Test Method

We ran the test in as controlled a manner as we could given our limited equipment. There are four strength tests usually performed on wood: tensile, peel, shear, and cleavage (see illustration).

We tested for cleavage because it's easy to do in a controlled manner. We used a hydraulic jack to apply pressure on an arm which we attached to test blocks with a specially made metal clamp. We wanted to apply controlled force, rather than simply hitting the blocks with a hammer, to be as certain as possible that we didn't introduce factors that could skew the results.

Some glues, for instance, are brittle, so a hammer blow may break the joint easily while controlled pressure would not. We also measured the force we applied, although that didn't turn out to be a factor. The pieces with successful glue joints all broke at about the same pressure. We used the same wood for the tests, and it was the wood itself that failed, not the joint. And we only used one criterion for establishing success: whether the joint separated at the glue line or the wood broke.

In all, we tested seven glues in six separate trials, using 42 blocks of wood edge-glued to boards. To reduce the chances of error caused by varying wood surfaces, the blocks and the board were cut from the same plank, and each was jointed on the same machine at the same settings. (The blocks were, of course, cut to length after the jointing.) We used so many trials because we wanted to test a variety of surface treatments and because we wanted to make sure our results would be consistent.

Test Results

The results are listed in the table below. Note that the tests were carried out only on teak. For other oily woods, the results may vary, although they should be similar. It's always best to test the glue before doing any glue-ups. But this table should at least give you a place to start in choosing a glue for a particular oily wood.

	Fresh Surface	*5-day Oily*	*5-day Washed*
Liquid Hide	No Good	No Good	No Good
Plastic Resin	No Good	No Good	No Good
Casein	No Good	No Good	No Good
Aliphatic Resin (Yellow)	Good	No Good	Good
Epoxy	No Good	No Good	No Good
T-88 Epoxy	Good	Good	Good
Resorcinol	Good	No Good	Good

What Works

As you can see, only one glue worked in all cases, the T-88 Epoxy. All the test blocks—on oily, cleaned or freshly jointed surfaces—had sound glue joints. In all cases, the wood failed before the glue joint. The T-88 Epoxy is similar to another epoxy specially formulated for use on oily woods, G-2 Epoxy (see Sources of Supply). We highly recommend them for use on oily woods, especially for outdoor use.

Note that epoxy not specially formulated for oily woods failed all the tests.

Next best were the resorcinol and the aliphatic resin (yellow) glues. They both worked on freshly jointed or washed surfaces. And they both failed when the wood was left for five days. Of the two, we prefer the yellow glue. It's much easier to use than resorcinol because it doesn't need mixing. Resorcinol is a bit tricky to use. With dense woods, for example, you need to spread glue on both surfaces and let the glue sit for 5 to 10 minutes before assembling the joint. So in general woodworking, yellow glue is fine for teak, as long as you're careful and work with freshly jointed or cleaned surfaces. But for outdoor pieces, use the resorcinol or one of the special epoxies; they're 100 percent waterproof.

What Doesn't Work

Also apparent from the table is the consistent failure of many of the glues, despite being recommended by various sources for oily woods. Perhaps there's some way to get them to work. For example, we didn't try some of the more caustic approaches. One source recommends a lye wash for the surface. Another suggests using acetone as the wash. We decided that if you have to go to such extremes, it's better to find another glue. Also of interest in the tests was the extreme ease with which some of the samples broke loose. Some bonds were so weak that the blocks broke loose as we were attaching the test apparatus.

Recommended Procedure

We recommend using the specially formulated epoxies, resorcinol or yellow glue for gluing teak. But you should be as careful as possible. Make sure you work with freshly jointed surfaces—within a couple of hours of jointing. If you want to be extra sure, also wash the surface with lacquer thinner. Keep rubbing off the oils until the surface takes on a white cast.

If it's not possible to joint the surfaces before gluing, be certain you wash the oils away with lacquer thinner.

Remember to carefully follow the directions for the T-88 or the G-2 epoxies, which are two-part glues that must be mixed prior to use. Note especially that epoxy sets without clamp pressure. You may want to use clamps just to position the parts properly. But don't apply anything more than light pressure or you'll starve the joint of glue and the bond won't hold.

For all oily woods, it's best to make a test before committing yourself to a particular glue. Some woods are even more oily than teak; lignum vitae contains a full 25 percent oil, and requires even more care than teak. For lignum vitae it's probably best to stick with the T-88 or G-2 epoxies. Some other difficult woods are cocobolo, rosewood, some ebonies and wenge. It's most often the oils and resins on the wood surface that interfere with the glue joints.

But that's not always the case. Improperly dried wood will also be difficult to glue because of the high water content. Water content for gluing should generally be between 6 and 12 percent. But tropical hardwoods are often shipped air-dried so actual moisture content can vary. It's good to keep that in mind, and an extra incentive to test your glue with each shipment of wood.

Sources of Supply

Gluing dense and oily tropical hardwoods often requires glues not available from your local hardware store. Three glues are especially difficult to find: resorcinal, T-88 Epoxy and G-2 Epoxy.

Resorcinol is available from several manufacturers: DAP Weldwood, Elmer's, and Wilhold. You can buy it mail-order from Garrett Wade, 161 Avenue of the Americas, New York, NY 10013, (212) 808-1155, or from the Frog Tool Co. Ltd., P.O. Box 8325, Chicago, IL 60680, (312) 648-1270.

T-88 Epoxy is manufactured by Chem Tech Inc. It's available from The Berea Hardwoods Co., 125 Jacqueline Drive, Berea, OH 44017, (216) 243-4452.

G-2 Epoxy is made by Industrial Formulators of Canada Ltd., and is available from: Woodcraft, 210 Wood Country Industrial Park, P.O. Box 1686, Parkersburg, WV 26102, (304) 428-4866.

Tung Oil:

Traditional Favorite Still A Good Choice

by Jim Barrett

Also known as China nut oil, tung oil is extracted from the nut of the tung tree, native to Asia, and now also grown in South America and Florida for nut production. Tung oil has a centuries-old history as a durable, long lasting protective finish—not only for wood, but for other materials as well. In early times, the Chinese reportedly used it to help preserve the Great Wall of China. A coat of tung oil on polished brass or copper will keep it from tarnishing.

In terms of wood finishing, tung oil belongs to a family of natural oils, called *drying oils,* which are found in many penetrating oil finishes and natural oil varnish formulations. Tung, boiled linseed, and walnut oils are the most common; other oils include safflower, soybean, oiticica, and Japanese wood oil. Unlike resin-based finishes, which rely on the evaporation of solvents to harden, these oils cure to a relatively hard, dry-to-the-touch film by the formation of molecule chains (small molecules joining to form large ones) in a process called *polymerization.* Most drying oils cure by oxidative polymerization (oxygen molecules bonding to oil molecules). A few, including tung oil, also cure by thermal polymerization (oil molecules linking together in the presence of heat).

This cross-linking of molecules is, in part, what makes tung oil a far better oil than linseed oil, in many respects. Compared to other drying oils, tung oil dries to a harder finish, with superior resistance to moisture, mildew, alcohol, chemicals, wear and abrasion. For this reason, tung oil makes an excellent penetrating oil finish by itself, or as the main ingredient in blended penetrating oil formulas. Tung oil is also the basic ingredient in higher quality exterior spar varnishes and oil-based floor and tabletop varnishes.

Like other penetrating oil finishes, tung oil is easy to apply with consistent results, easy to maintain and repair. (Many woodworkers prefer penetrating finishes over lacquers, varnishes, and polyurethanes because they emphasize the natural color and grain pattern of wood, and impart the mellow patina associated with fine antique furniture.) But, unlike other penetrating finishes, which produce a soft, low sheen, tung oil can be built up to a very high luster, depending on how many coats you apply and how fine an abrasive you use to rub out the final coats. Tung oil is unique in that it can impart a brilliant, mirrorlike finish without the "glass-over-wood" effect common to gloss lacquers and varnishes. Each additional coat increases the durability of the finished surface (see Applying Tung Oil, page 22). Also, tung oil has less tendency to "yellow" or darken wood like linseed oil-based finishes.

While tung oil makes a durable penetrating finish, it is not as durable as many synthetic varnishes, epoxy finishes and polyurethanes, and generally won't hold up as well as these on high-wear surfaces, such as tabletops, floors, or countertops.

Choices in Tung Oil Finishes

As mentioned, straight tung oil makes an excellent penetrating finish by itself, displaying the qualities just discussed. Penetrating finishes that combine tung oil with other oils, resins, urethanes, and additives may be less expensive, but they won't give you the same results.

Two types of tung oil are available—pure tung oil and polymerized tung oil. Pure tung oil is just that—100 percent pure oil with no additives. Application is somewhat more tricky than with polymerized tung oil; in most cases you'll need to thin it with mineral spirits before application, and it takes longer to cure.

Polymerized tung oil is pure oil that has been heat-treated to start the thermal polymerization process before application, which results in a faster dry time and a harder, glossier finish. Also, the oil is pre-cut with petroleum distillates for ease of application, and metallic driers are added to further speed the dry time. The amount of polymerization that takes place during formulation, combined with the proportions of solvents and driers used, determines the consistency, or percentage of oil solids in the mixture. Formulas vary from one manufacturer to

the next; some manufacturers offer several "grades" of oil for different applications. For example, a 20–25 percent light-bodied oil penetrates the wood more deeply and imparts a low sheen; heavier bodied oils (35–50 percent) require fewer coats to impart a high luster and harder finish, but won't penetrate as deeply.

For most projects, we recommend a polymerized tung oil because it is easier to use, dries more quickly, and provides a harder, glossier finish relative to the number of coats applied. Popular brands include *Jasco Tung Oil Old Fashioned Finish, Sutherland Welles Polymerized Tung Oil, J.E. Moser's Polymerized Tung Oil* and *Formby's Low Gloss Tung Oil Finish.*

Surface Preparation

Like other penetrating oils, tung oil requires a smoother surface than you would need for a surface coating. We recommend sanding up through a 320-grit (or using a cabinet scraper, followed by a light sanding with 320 paper). Vacuum off dust or clean the surface with a tack cloth.

Sealers and Fillers

Tung oil requires no sealer, because the first few coats serve as such. If using pure tung oil, make a sealer coat by cutting with 50 percent mineral spirits. Apply a liberal coat, soaking the wood thoroughly, and allow to cure for 24 hours. If using polymerized tung oil, rub in an even, light coat, and let dry (four to eight hours longer than specified on label instructions).

Ordinarily, we don't use fillers, even on open-grained woods such as oak or mahogany. With tung oil, four or five coats will usually fill in the pores. But, if you want to save time, or apply fewer coats of oil, you can use a filler. First, apply a sealer coat as described above. Then, wipe on a slurry of paste wood filler mixed with tung oil, let dry, and sand smooth. You can tint the filler with a stain to match the wood, or buy a colored filler.

Stains

Tung oil can be used over many types of stains, but you should consult the stain manufacturer to make sure the stain will be compatible (tung oil may reflow some oil-based stains, creating a blotchy appearance.) A more common practice is to tint the first coat of tung oil with Japan colors or universal tinting colors.

Applying Tung Oil

Because various degrees of sheen or luster can be achieved by the number of coats applied and the abrasives used to level or buff the surface, different furniture finishers have developed their own pet application techniques to produce a result that pleases them—from a soft, satin hand-rubbed look to a mirrorlike gloss. Generally, the more coats you apply, and the finer the abrasives you use, the higher the luster. Experienced finishers can obtain a deep, mirror finish by applying a dozen or more thin coats and buffing the final ones with rottenstone or jeweler's rouge, but this takes plenty of patience and practice.

No matter how many coats you want to apply, you'll get good results if you follow these basic tips:

Ideally, you should apply the finish when the outside temperature is between 68 and 70 degrees with a relative humidity of 65 percent or less. Avoid direct sunlight. Tung oil will penetrate more deeply, offering greater protection, if you first heat it by placing the container in a pan of hot tap water for 5–10 minutes.

To apply the first coat, pour a liberal amount of oil on the surface and allow it to penetrate for 5–10 minutes. Then, briskly rub the remaining oil into the wood with a soft cloth or fine (0000) steel wool. Wait another 5–10 minutes, then rub more oil into any dull spots that have appeared. Do not wipe off excess. Let dry at least four hours longer than the time recommended by the manufacturer, then rub out the finish with a quality *long strand* 0000 steel wool, or wet-sand with 600-grit wet/dry sandpaper. Apply light successive coats, wiping off excess, and buffing or sanding between each. We recommend at least five coats for a durable finish; add more to increase luster, rubbing out the final top coat with rottenstone.

Storage

Because tung oil dries by oxidation, you'll need to store any remaining oil in an airless container. Do this either by decanting it into a smaller can, filled to the brim and tightly sealed, or by dropping clean marbles into the original can to raise the fluid level to the top. Some tung oils come in plastic bottles—squeeze the sides of the bottle to raise the fluid level to the top, then cap tightly. Before reusing the oil, strain it through cheesecloth to remove any solidified oil particles.

Maintenance

Although tung oil dries to the touch and the project will be serviceable within 24 hours, the finish will take up to one year to cure fully. For this reason, you should not apply waxes or polishes during this time, or curing will be impeded. Just wipe the piece down occasionally with a water-dampened rag. After the surface is fully cured, you can either apply a coat of lemon oil or another light coat of tung oil to restore the luster (do not use paste waxes). Likewise, scratches or surface blemishes can be removed by first buffing the area with steel wool, then touching up with more tung oil.

Sources

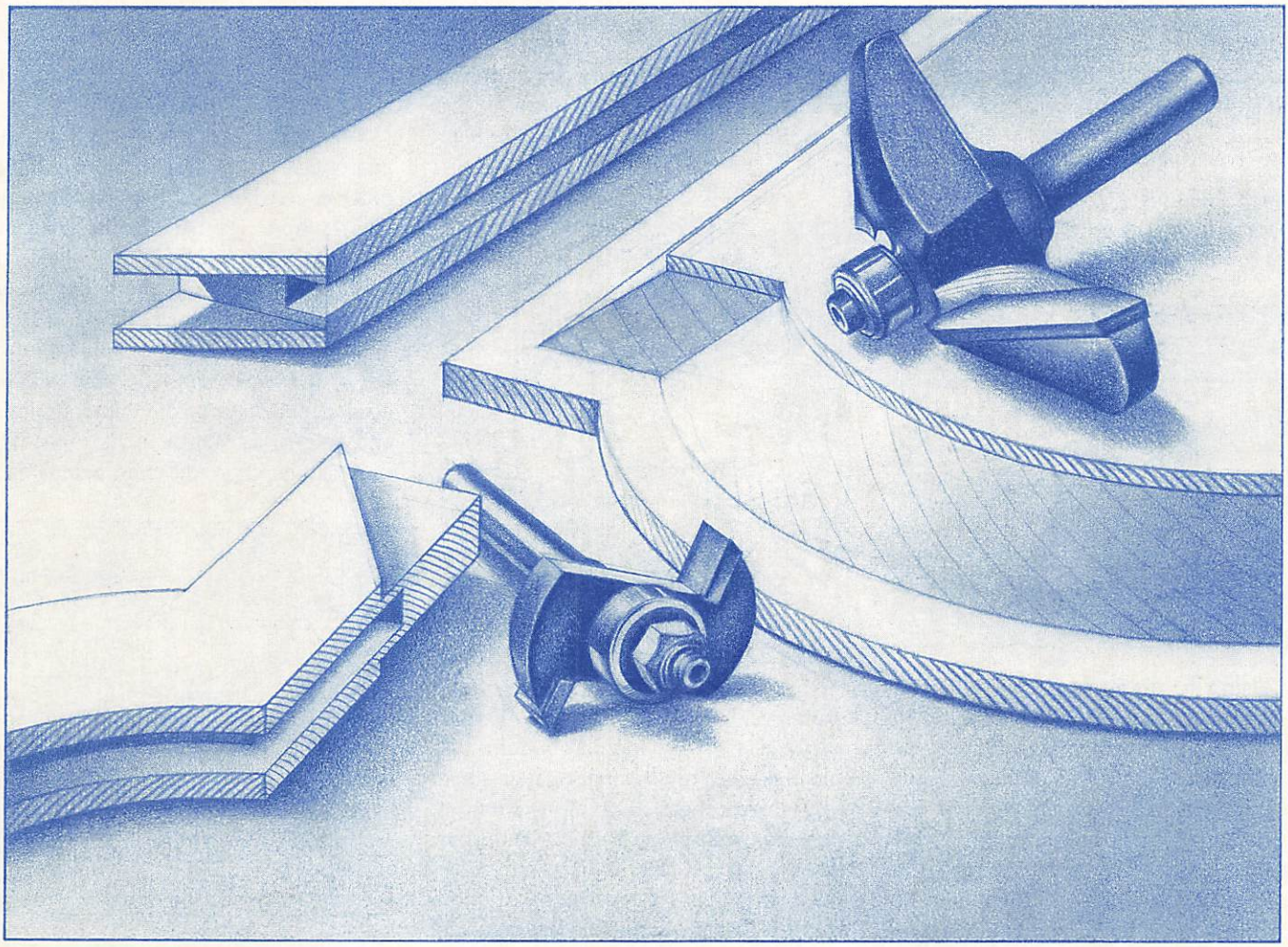
Garrett Wade
161 Ave. of the Americas
New York, NY 10013

Jasco Chemical Corp.
1710 Villa St., P.O. Box J
Mountain View, CA 94042

Lee Valley Tools
1080 Morrison Dr.
Ottawa, Ontario
Canada K2H 8K7

Woodcraft
210 Wood County Industrial Park
Parkersburg, WV 26102

Wood Finishing Supply Co., Inc.
100 Throop Street
Palmyra, NY 14522



Making a Tombstone
Frame-and-Panel Door

Don't let the Special Techniques heading fool you into thinking that this is only for experienced woodworkers. The special element here is the arched profile (called a tombstone) and the extra handwork that it entails. Except for the few extra steps that the tombstone detail adds, this is basically just another raised-panel door.

The door shown is used on our Tabletop Armoire (page 57). However, the same basic technique can be used for almost any small tombstone frame-and-panel door. Just adjust the width and length dimensions of the frame parts. The raised panel was shaped with a panel raising bit. The bit is available from MLCS Ltd., P.O. Box 4053, Rydal, PA 19046 (Tel. 1-800-533-9298). Order their part no. 686 ($45 postpaid). This is a 1/2 in. shank bit, so you'll need a router with a 1/2 in. capacity collet. The larger, more powerful router is a must to power a bit of this size.

Our door features a mitered bridle joint frame. The bridle joint tongue is cut on the rail ends, and a mating groove is cut on the stile ends. The fussy part is the miter on the rails, which can't be cut with just a single miter gauge setting.

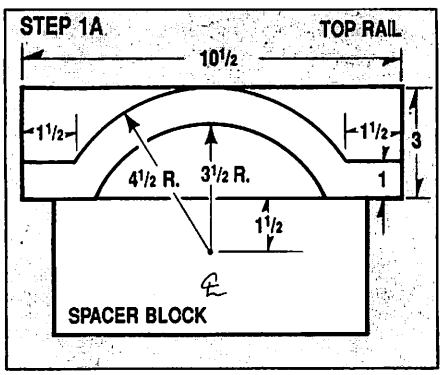
Because our Tabletop Armoire is a painted piece, we used pine for the construction. Pine makes an ideal wood for several reasons. It doesn't cost much so there won't be much of a loss if you make a serious mistake. And, because pine is so easy to cut, the chisel work needed to clean up the inside corners of the tombstone raised panel should not be a problem. Finally, because pine is close-grained, it takes paint very well. Just be sure to avoid using any stock with knots, since knots in pine sometimes telegraph through paint.

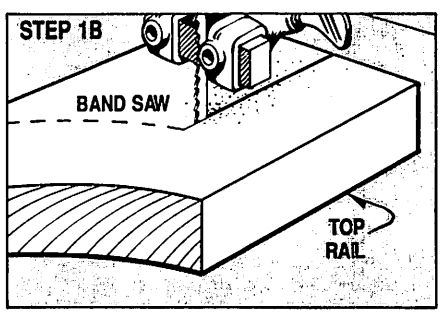
Before starting on the step-by-step instructions, cut all your door parts to size. The dimensions are given in the Bill of Materials on page 60. Make your

door after completing the case, so you can adjust part sizes if necessary.

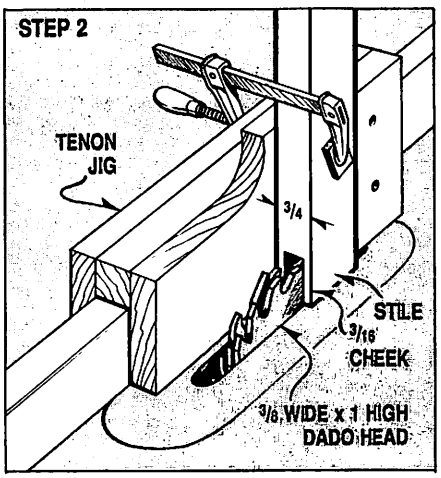
Step-By-Step

Step 1: Using a compass, lay out the concentric curves on the top rail stock. The easiest way to do this is to temporarily clamp the stock to a flat surface, with a 3/4 in. thick spacer block adjacent to raise the compass point to the same plane. Locate the center point as shown 1 1/2 in. from the bottom edge of the stock, and then use the compass to scribe the two radii, which are 4 1/2 in. and 3 1/2 in. respectively (Step 1A). Then use the band saw to cut the profile (Step 1B).

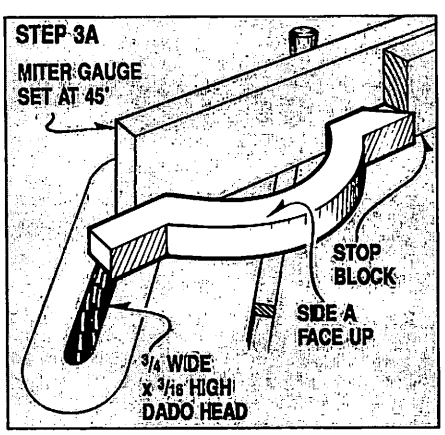




Step 2: Cut the bridle joint on the stile ends. You'll need a dado head, mounted in the table saw and set to make a 3/8 in. wide cut. You'll also need a tenon jig to support the stock, which must be passed across the cutter on end. The tenon jig we use fits over and rides on the fence. As shown, since our frame parts are 3/4 in. thick, and we're using a 3/8 in. thick tongue in our bridle joint, the tenon jig and fence are located so the dado cut leaves 3/16 in. thick cheeks on either side. Note that the dado head is raised to a height of 1 in., a dimension equal to the width of the stile and rail parts at the joint. Repeat the cut on both ends of both stiles.

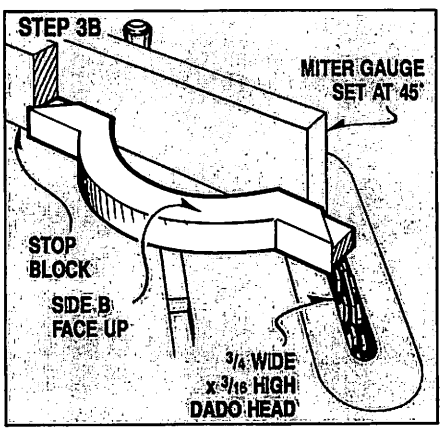


Step 3: To cut the bridle joint tongue on the ends of the top and bottom rail, you'll need to use the miter gauge set at a 45-degree angle. But before going to work on your project stock, test your miter gauge setting with some scrap stock. If the cut isn't a true 45 degrees, you'll have gaps at the inside or outside point of the miters when you assemble the door frame.



Once again use the dado head, but increase the width to 3/4 in. The height of the dado head must be 3/16 in. to establish the 3/8 in. tongue thickness. Note that these settings assume that your stock is exactly 3/4 in. thick. If the actual thickness of your stock is not 3/4 in., then you'll need to adjust the settings to reflect the stock dimension.

The most accurate way to make these miter cuts is by using a stopblock. But in order to cut both sides of each tongue, you'll have to reverse the miter gauge to the opposite side of the blade, in addition to reversing the miter gauge angle to the complementary 45 degrees. With your miter gauge in the slot to the left of the blade, you'll be able to make a miter cut on opposite ends of side A and side B, as shown in Step 3A. The illustrations show the cuts being made on the curved top rail, but you'll follow the same procedure to cut the straight bottom rail.

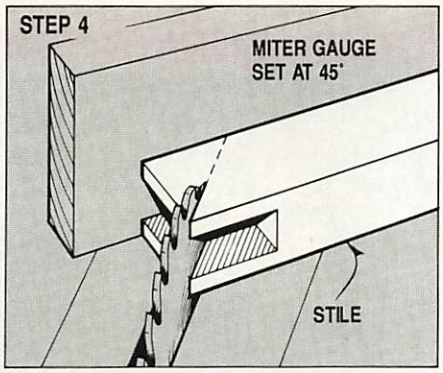


The miter gauge angle must be reversed, and the miter gauge must be located to the right of the blade, in order to cut the remaining miters (Step 3B). But because you have to reset both the miter gauge and the stopblock, there's only one way to get the setting exact. The technique requires that you cut a few extra miters on scrap pieces the same length as your work stock in Step 3A, then use those scrap pieces to test the stopblock setting in Step 3B until it's just right.

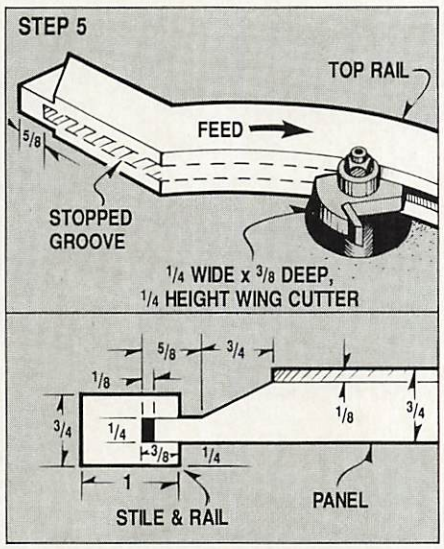
Another way to cut the joint on the rail ends is with a 45-degree miter cutting jig. The jig is a timesaver if you do a lot of framing work. It's basically just a sliding table with fixed 45-degree guideblocks that rides in the table saw miter gauge slots. Plans for both 45-degree and 22 1/2-degree miter cutting

jigs were featured in our September/October 1988 issue (Volume 12, No. 5).

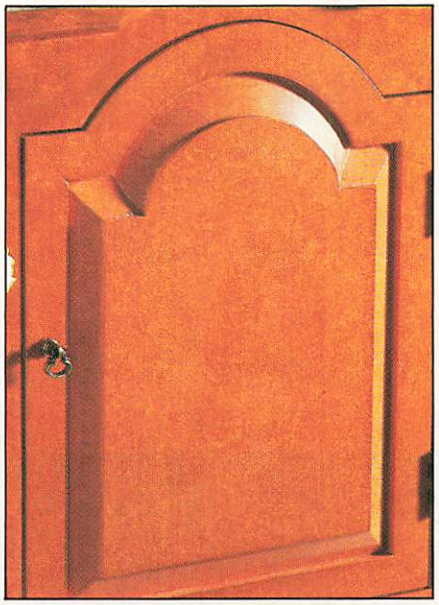
Step 4: All that remains of the frame joinery is to miter the stile ends. Angle the miter gauge to 45 degrees and use a stopblock to insure the proper length, as you did with the miters in Step 3. One setup is all you'll need though, since the miter cuts are through. Just be sure to use a sharp blade to avoid tear-out on the top cheek, which won't be supported.



Step 5: We used a wing cutter to make the panel groove in the stiles and rails. The wing cutter is a must to cut the groove in the curved top rail—without a lot of hand work—and once you are set up it's easy to also cut the bottom rail



and stile grooves. The wing cutter we used cuts a 1/4 in. wide by 3/8 in. deep groove. It's part no. 368, also available from MLCS (see page 23 for address and

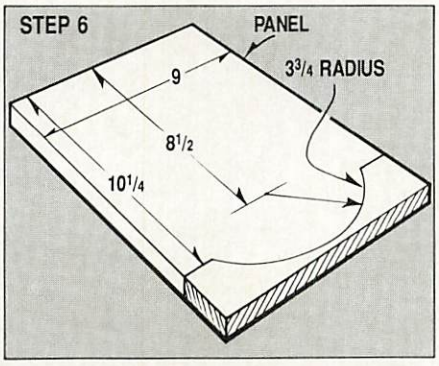


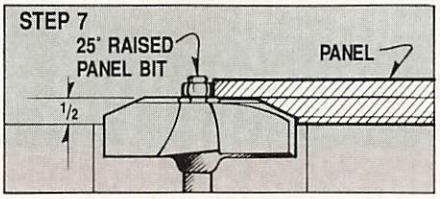
phone). Cost for this cutter is $14 postpaid. Note that on the top and bottom rails, you'll need to make a stopped groove, since you don't want the cut to show on the ends.

As shown, the panel is sized so its tongue fits about 1/4 in. deep into the groove in the stiles and rails. This allows for wood movement in the panel.

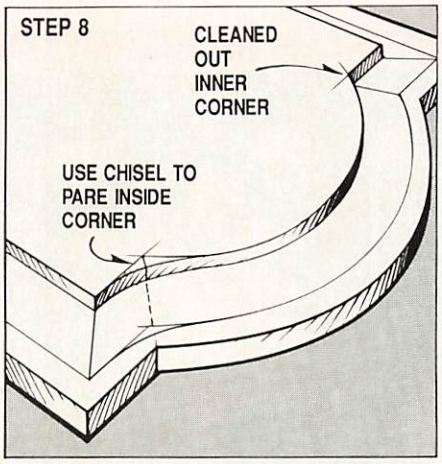
Step 6: Lay out the tombstone profile, then use the band saw to cut the panel to size.

Step 7: With the panel raising bit mounted in the router table, now cut the raised panel detail.





Step 8: As shown, the panel will need a little handwork on the inside corners of the tombstone top, where the panel raising bit did not reach. Use a sharp chisel to clean out the inside corners. This part is a little like carving, but much easier. Use a sharp pencil to continue the lines of the radius and tombstone shoulder, then clean back to the line, being careful to maintain the proper bevel. Note that maintaining the plane of the



bevels is particularly important in order to get a good straight line where they meet. It helps to first use a knife to establish this line and then pare along the bevels until they meet the knife cut.

After final sanding, apply the painted finish to the panel, then assemble the frame around it. If you try to apply the finish after assembly, when the raised panel contracts, you'll see a strip of unfinished surface appearing at the panel edges. Drill a pilot hole, then drive a small nail into the panel at the center point of the top and bottom rails. This will help to equalize wood movement in the panel.

Although our frame-and-panel shows a 1/4 in. thick tongue on the panel fitting into a 1/4 in. wide groove in the stiles and rails, in practice you should sand the panel back enough to thin the tongue down to about 7/32 in. thick. If you don't allow this extra, then the paint will peel off as you insert the panel into the frame. Instructions for the painted finish are on page 60.

Tropical Woods Under Fire:

Are Woodworkers Killing Our Rain Forests?

Is mahogany political? Is there a morality of teak? Does a padauk coffee table contribute to global warming?

With some environmentalists calling for a total ban on the import and use of tropical hardwoods, woodworkers are suddenly finding their choice of woods challenged on environmental grounds. Some groups, like the Rainforest Action Network (RAN), which is calling for the ban, say that the timber industry is largely responsible for the destruction of vast areas of the world's rain forests, and that the deforestation is a major cause of global warming by increasing worldwide carbon dioxide levels.

The tropical timber industry agrees that rain forests are disappearing too fast, but disagrees with the assertion that it's the fault of the industry. The industry maintains that ranchers and poor farmers are burning off the forest, and that the lumber industry actually helps prevent the burning by providing a cash crop. Without that income, the argument goes, there would be no economic incentive to maintain the rain forests.

"The sides are lining up and the issue to the woodworkers is: Should the woodworker be on a guilt trip because he's using tropical hardwoods? And the answer is no. The root cause is poverty and they're trying to blame us," said Donald Thompson of Thompson Mahogany, an importing firm in Philadelphia.

But the industry agrees on the urgent need to do something to save the rain forests; they are disappearing at an alarming rate. The question is how to do that effectively. And the issue is clouded by a bevy of claims and statistics that the various sides hoist in their defense (see Claims and Counterclaims). Because the forests remain relatively little studied, there's no easy way to sort out who is right.

Many environmentalists also disagree with the ban proposal. Some worry that cutting off the trade in tropical hardwoods could have severe and unpredictable repercussions on the local economies of producing countries. The Rainforest Alliance, which isn't connected to RAN, is against a ban except in specific cases where it can be clearly demonstrated that a wood species is endangered.

"A ban definitely gets attention; I don't think it gets the positive benefits we're looking for," said Ivan Ussach, vice president of the Rainforest Alliance. "I think there's a place for some selective boycotts, but an across-the-board boycott has the potential to do as much harm as good."

Many environmentalists are focusing their efforts on research into the state of the forests and ways to help preserve them. They say what's needed now is more firm information about which species are threatened and how to promote responsible use of the forests.

"No one is doing enough research on this and who knows what's going on down there in the tropical forests," said Byron Swift, executive director of the International Union for the Conservation of Nature – U.S.

So far, environmentalists disagree on which wood species are endangered or "threatened." There are several lists of endangered wood species. One group, Friends of the Earth, a worldwide environmental group, lists teak as a wood generally all right to use because it's widely grown on plantations, while the RAN group includes teak on its list of woods to avoid. RAN says teak is being over-cut even on the plantations, and that teak should also be avoided for political reasons. The reasoning is that the government of Myanmar, formerly known as Burma, is using teak sales to finance a civil war.

The tropical timber industry claims that the various lists of endangered species are misleading. Industry sources say that the environmental groups are being intellectually dishonest by using interchangeably such terms as "endangered" or "threatened" or "in danger of economic extinction." They say the groups make it seem as though the terms are synonymous, and include woods with those various characterizations on a general lists of woods to avoid. But while endangered has a biological definition as a species in danger of becoming extinct, there is no agreement on what constitutes a "threatened" species or a species "in danger of economic extinction."

Mr. Thompson also said that it's just not true that any of the tropical timber on the market is endangered. For instance, he said he knows there's "half a continent" of afrormosia in Zaire, even though the wood is listed as "facing economic and biological extinction," in the Good Wood Guide published by The Friends of the Earth.

When contacted about the apparent contradiction on afrormosia, Friends of the Earth spokesmen were not able to substantiate the claim. One spokesman, Beth Stein, said the list is "being revised." Another spokesman referred specific questions on the sources of the information to the group's London headquarters, where spokesman Simon Counsel said the information supporting the claim is fragmentary. But, he said, "there is sufficient evidence that many of these species are being over-harvested." When asked, Mr. Thompson wasn't able to cite a specific source for his afrormosia claim either.

The misrepresentation of the fragmentary information as fact has irked many, especially on the industry side.

"It's disappointing that people are saying so much authoritatively, on so little information," said Ted Tuescher of the Smith & Hawken Co., which makes teak furniture.

Still, RAN claims the call for a ban on tropical hardwoods isn't in response to the danger to specific species, but rather to the overall destruction of the rain forests. Pam Wellner, tropical timber campaigner for the group, said that the forests are threatened worldwide and that logging is the leading cause.

The figures on how much tropical rain forest is lost every year are truly astounding. According to the World Resources Institute, 27 million acres are lost every year. Rain forests are believed to be vital to the planet's ecosystem because the trees recycle carbon dioxide into oxygen and the atmosphere's carbon dioxide levels have been increasing in the industrial age. Some scientists say the increased levels of the gas are warming the planet, creating a "greenhouse effect" and will cause vast climatic changes. Some people advocate a worldwide tree-

planting campaign to help restore the carbon dioxide balance.

One of the points of contention between the industry and RAN is whether it is loggers or cattle ranchers and subsistence farmers who cause the deforestation.

RAN contends that loggers lead the way, building the roads into the tropical forest. Once the loggers are through, then farmers and ranchers use the roads for access and finish the destruction.

"The first people to penetrate the forests are the logging companies," Ms. Wellner said. Moreover, RAN says that logging roads alone destroy a full one-third of the rain forest land and that 10 trees are destroyed or damaged beyond repair for every tree taken for timber.

But the analysis is disputed by other environmentalists, as well as the timber industry. The rain forests and the tropical hardwoods are in danger not because of the timber industry, but because of the vast acres chopped down or burned for other reasons. "Species are endangered because you're chopping down the forest (for ranching or subsistence farming), not because you're using it for woodworking," said Mr. Swift.

On one fact almost everyone can agree, loggers are not alone responsible for the devastating loss of the world's rain forest cover. There are plenty of causes. In Brazil, home to most of the Amazon rain forest, the government has been accused of gross negligence for failing to protect the rain forests, and even encouraging land use that destroys the rain forests. For example, the government encouraged resettlement of peasants from the desperately poor Northeast to the Amazon basin. Once there, the peasants practice slash and burn agriculture, removing the forest cover as quickly as possible so they can plant crops. But the Amazon basin has a thin cover of topsoil that is quickly depleted of nutrients after several growing seasons, so the peasants are forced to constantly clear more land.

Also in Brazil, politically powerful cattle ranchers burn off vast areas of rain forest to create short-lived pasture land. The cattle ranchers alone cause 80 percent of the yearly destruction of rain forest land in Brazil, according to The New York Times.

Financial institutions like the World Bank have encouraged quick development of the Brazilian Amazon basin as a way for the country to help pay off its vast foreign debt. A $250 million World Bank loan financed a road into the jungle which opened up the Rondonia area of the Amazon basin to land-poor farmers, cattle ranchers and loggers.

Into this complex soup of destruction add such factors as the problem of the indigenous people trying to maintain their traditional lifestyle, and of a newly democratized national government trying to find ways to pull the country out from under a crushing load of foreign debt.

It's a complex problem, with a bevy of claims and counterclaims on all sides of the issue. But a workshop sponsored by the Smithsonian Institution and the International Hardwood Products Association (IHPA) in October 1989 tried to sort out some of the conflicting claims and come up with a policy that will help save the rain forests, without wrecking local economies or the tropical timber trade. The Tropical Timber workshop included scientists, environmentalists, timber traders and government officials. The workshop concluded that a ban isn't the answer, and that the timber industry has a key role in helping the rain forests to survive.

"The two major conclusions of the workshop were that tropical forests will be preserved only if they are accorded economic value, and blanket bans and embargoes (as contrasted to selective ones) on tropical hardwood will tend to depress the value of those hardwoods and the forests that contain them. Such constraints generally diminish the economic incentive to conserve and manage these forests in the face of alternative land uses which lead to their

Claims and Counterclaims

Rainforest Action Network	Industry
• The principal cause of tropical deforestation is demand for tropical forest products.	• Cattle ranchers and poor farmers are responsible for 80 percent of deforestation.
• Many commercial woods are endangered or threatened and a total ban is needed now.	• The group is using scare tactics and misleading the public. No commercial woods are now endangered.
• There are too few plantations being established for sustainable yield forestry: less than 1.5 million acres of plantation established each year worldwide.	• One recently established sustained yield preserve contains 3 million acres in one tract in South America. There are nearly 5 million acres of plantation-grown trees in Indonesia alone.
• Logging ruins rain forests. The ecosystem is so fragile that it can't recover from the extensive damage done by the heavy machinery and trucks.	• Usable tropical species are widely scattered, less than one per hectare (2.47 acres), and the ecosystem is only slightly affected by harvesting.
• For every tree felled for timber, 10 more are destroyed or damaged beyond repair.	• Felling trees causes little damage to surrounding trees.
• Only 7-8 years left of forest production remains in Malaysia, a major teak producer.	• Sustainable-yield forestry projects now cover 13 percent of Malaysian land area.

An Old Trade Gets a New Wrinkle

It sometimes seems that industry and environmentalists fall automatically into different camps in just about all of the world's pressing environmental concerns. But the tropical forest issue has many people that seem to have a foot in each camp.

The Ecological Trading Company in Great Britain is marketing woods imported exclusively from sustainable-yield forestry projects designed by environmentalists. Thus far, the firm has made arrangements to buy wood from a project in Ecuador and one in Peru. Both projects are designed so that logging disturbs the forest as little as possible. In the Palcazu project in Peru, the Amuesha Indians, with the help of the World Wildlife Fund and the U.S. Agency for International Development, have set up a cooperative venture to implement a sustained-management system.

The cooperative removes all the trees in 100-foot wide strips. The strips allow the surrounding forest to provide protection from the sun, so the soil isn't baked and eroded away. The strip harvesting also maintains the biological diversity of the forest, so the surrounding trees and plants can regenerate on the cleared land, environmentalists say.

The Indians do the logging and also run a portable sawmill which was trucked to the site. The sawmill allows the Indians to export finished boards, instead of raw logs, also reducing trucking and shipping costs. The Indians are also making and selling finished furniture.

Before the cooperative began, the Indians' income was derived from the cattle ranchers, who burn off the forest cover to create pasture.

Also involved with the Peru project is a California supplier of musical instrument woods, The Luthier's Mercantile. John Curtis, partner in The Luthier's Mercantile, visited the unique project and is helping to market and distribute the wood.

One of the project's unique features is that it attempts to market woods not usually sold for export. Curtis said that there are many beautiful and useful tropical wood species not exported simply because they're unknown outside their native regions. The Peruvian portion of the Amazon basin is especially rich in unusual wood species, so the project is trying to increase the economic base of the area by finding a market for these unusual woods.

The woods can be substituted for other well-known woods like mahogany, teak and rosewood. They have similar properties and color. But the strange-sounding names tend to deter many buyers. Few have heard of cuiarana, a rosewood substitute, or garapa, known for its durability and used in boatbuilding.

The Palcaza project is providing about 20 "new" species of wood, that are now available or will soon be available from The Luthier's Mercantile and The Ecological Trading Co. For more information, write to The Luthier's Mercantile, P.O. Box 774, Healdsburg, CA 95448.

There are also cooperative efforts of governments and environmentalists to set aside large tracts of land for sustainable-yield management. One South American project in Bolivia has set aside 3 million acres in a swap of debt for environmental easements that will insure sustained yield management of the forest.

Also, many individual craftspeople have a strong commitment to the environment. Some are pledging not to use woods listed by the environmental groups as threatened or endangered. Others are withholding judgment until more is known. This past winter, the American Craft Council considered banning exotics from their ACC Craft Fairs. After review of the issues, the council decided against the ban.

destruction," said Wendy Baer, vice president of the IHPA.

Managing the forests is, to many environmentalists, the key to insuring their survival. There are plans in the works to create sustainable-yield forestry projects in the tropics (see story above). Some countries are now taking their responsibilities to preserve virgin forest stands very seriously. Indonesia has recently sharply increased its taxes on rough-sawn lumber. And Indonesia is growing more trees than are cut down.

Also, there's an effort under way by the Rainforest Alliance to create a labeling system for wood products so consumers will be able to tell whether their lumber comes from sustainable-yield sources. That effort has several hurdles to overcome before it becomes reality. For example, there is not yet any agreement on what exactly constitutes a sustainable-yield source. In rough terms, sustainable-yield means planting as many trees as are cut down. But there are a lot of questions about how best to do that in the complex environment of the tropical rain forests.

The Tropical Forestry Workshop sponsored by the Smithsonian agreed that the International Tropical Timber Organization and the Food and Agriculture Organization of the United Nations "should devise and promote an internationally agreed-upon system for rating and documenting tropical timber production according to sustainability."

But as yet, there is no way of telling if a particular board comes from a responsibly managed forest or from a stand of rain forest that was clear-cut by cattle ranchers in Brazil. But there are many projects around the world now under way to establish sustainable-yield sources for tropical timber (see story above).

SHAKER TALL CLOCK

The Shaker Tall Clock is an heirloom piece that will repay your weeks or months of dedicated woodworking with untold years of satisfaction. A clock built by Shaker Erastus Rude inspired this version, which has been changed to accommodate modern woodworking techniques. The Rude clock can still be seen at the Shaker Museum in Old Chatham, New York.

The clock features an eight-day movement, which sounds its Westminster chimes on the quarter hour, and strikes its four-note gong on the hour. The Mason & Sullivan Co. of West Yarmouth, Massachusetts, has agreed to supply the movement and the clock hardware (see Sources).

We used cherry for the clock, but you may choose another wood like walnut, mahogany or figured maple.

With a project of this complexity, it's *not* a good idea to start by cutting all your lumber to the exact sizes listed in the Bill of Materials. You should cut the parts as you go along. The clock has three separate sections that must fit together perfectly, so you'll need to vary the size of some parts to accommodate small errors that creep in during construction. As we go through the construction steps, we'll note the critical parts and explain how to adjust the sizes to fit.

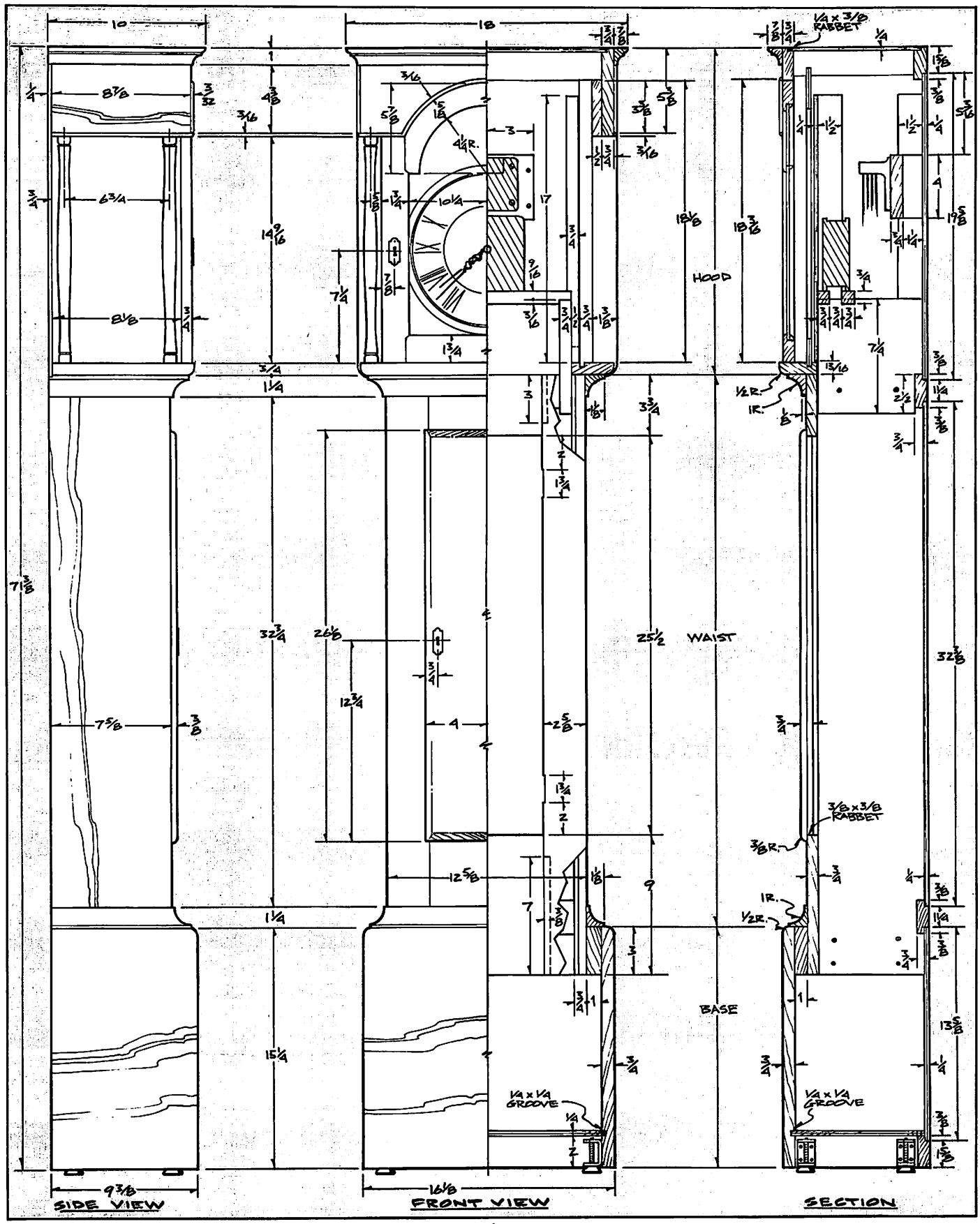
The Waist

We started with the waist so that we could adjust both the hood and base to fit. Cut the waist sides (A), the waist stiles (B), the waist top and bottom rails (C and D) and the waist back rails (E) to the sizes shown in the Bill of Materials. Note that the rail lengths given in the Bill of Materials include the 3/8 in. long tenons (see Fig. 1). The waist back (G), door (H) and molding (F), are cut to fit after the waist is assembled.

Mortise and tenon joints are used in the front framework around the door opening, while a tongue-and-groove joins the front framework to the sides. The two rails at the top and bottom of the back tie the case together.

Now, cut the mortises and tenons for the front frame. Use a router to establish the 1/4 in. wide by 3/8 in. deep mortises in the stiles, and square them up with a chisel. Then cut the tenons on the table saw with a dado blade. Make them a little shorter than 3/8 in. so they don't bottom out in the mortises.

With the dado blade still in the table saw, establish the 1/4 in. by 1/4 in. grooves that are 1/2 in. from the outside edges of the



stiles. The grooves receive the tongues on the sides, which are cut next. Note that the tongues on the sides are made by cutting a 1/4 in. wide by 1/2 in. deep rabbet into the outside of the workpieces. But the rabbets along the back edges of the sides, which are established next, are cut along the inside of the workpieces and are 1/4 in. wide by 3/8 in. deep. Also, notch the sides to fit inside the base back (S).

Now, with the dado blade establish the 1/4 in. deep by 3/8 in. wide rabbets on the back rails (see Fig. 1). Then flip the workpiece over and use a miter gauge and dado blade to cut the 3/8 in. wide by 1/2 in. deep notches on the ends of the rails.

Next, make up about 6 ft. of the waist molding. To get the 1

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
	Waist/Hood Support		
A	Side	3/4 x 7 1/8 x 38 1/4*	2
B	Stile	3/4 x 2 5/8 x 38 1/4	2
C	Top Rail	3/4 x 3 3/4 x 8 1/8*	1
D	Bottom Rail	3/4 x 9 x 8 1/8*	1
E	Back Rail	3/4 x 2 x 11 7/8	2
F	Molding	1 1/8 x 1 1/4**	as req'd
G	Back	1/4 x 11 7/8 x 32 3/8	1
H	Door	3/4 x 8 x 26 1/8***	1
I	Movement Seat Support	3/4 x 6 5/8 x 7 1/4	2
J	Movement Seat	3/4 x 3/4 x 11 1/8	2
K	Dial Mount Support	3/4 x 1 1/2 x 17	4
L	Guide	1/2 x 1 x 3 1/2	2
M	Dial Mount	1/4 x 12 1/8 x 17	1
N	Chime Mount Spacer	3/4 x 1 1/4 x 4	2
O	Chime Mount	3/4 x 4 x 6	1
P	Hood Back	1/4 x 13 1/2 x 19 5/8	1
	Base		
Q	Front	3/4 x 15 1/4 x 16 1/8	1
R	Side	3/4 x 15 1/4 x 9 3/8	2
S	Back	1/4 x 15 3/8 x 13 5/8	1
T	Back Rail	3/4 x 2 x 15 3/8	1
U	Front Filler	1 x 3 x 14 5/8	1
V	Side Filler	1 x 3 x 7 3/8	2
W	Bottom	1/4 x 8 5/8 x 15 1/8	1
	Hood**		
X	Top	1/4 x 8 1/2 x 15 1/2	1
Y	Side	3/4 x 8 1/8 x 18 3/8*	2
Z	Dial Frame	1/4 x 12 3/4 x 18 3/4	1
AA	Gallery Front	3/4 x 5 9/16 x 16 1/4	1
BB	Gallery Side	3/4 x 5 9/16 x 8 7/8	2
CC	Column	3/4 dia. x 15 5/16 long**	4
DD	Back Rail	3/4 x 2 x 15 1/2	1
EE	Front Collar	3/4 x 2 1/2 x 16 1/4	1
FF	Side Collar	3/4 x 2 1/2 x 9 1/8	2
GG	Molding	7/8 x 1	as req'd
HH	Spacer	1/2 x 3 9/16 x 8 1/8	2
II	Cockbead	3/32 x 3/16**	as req'd
JJ	Curved Cockbead	3/32 x 3/16**	as req'd
KK	Wing	1/4 x 11/2 x 21	2
	Door		
LL	Upper Rail	3/4 x 5 7/8 x 13 3/4*	1
MM	Lower Rail	3/4 x 1 3/4 x 13 3/4*	1
NN	Stile	3/4 x 1 3/4 x 14 9/16	2
OO	Glass	Have cut to fit	1
PP	Retainer	1/4 in. quarter round**	as req'd
	Hardware		
QQ	Dial	as shown**	1
RR	Movement and Hands	as shown**	1
SS	Chimes	as shown**	1
TT	Butt Hinge	1 1/2 x 1 1/4**	2
UU	Offset Hinge	2 1/4 x 2 1/2**	2
VV	Lock	as shown**	2
WW	Escutcheon	as shown**	2
XX	Leveler	as shown**	4

* Includes tongue or tenon
** See Sources, page 35
*** As dimensioned, door with 3/8 in. x 3/8 in. rabbet allows 1/16 in. all around for fit.
**** As dimensioned, hood includes 1/8 in. allowance for fit over hood support.

in. radius cove, it's easiest to use a wood hollowing plane, a combination plane, or a shaper. Router bits don't come large enough for the molding. The wood hollowing plane and the combination plane are available from Frog Tool Co., 700 West Jackson Blvd., Chicago, IL 60606; (312) 648-1270. Order catalog number 895K5 for the wood plane, which sells for about $100, and catalog number 592V18 ($164.80) for the combination plane. The combination plane comes with 7/8 in. wide cutters that you grind to the 1 in. radius. But these planes are for those making a serious commitment to restoration or reproduction work. If you can't see spending that kind of money for one clock, and don't have access to a shaper, you can buy the molding from Mason & Sullivan.

However you make the molding, put it aside until after the next step, assembling the waist.

Assemble Waist

First, make a dry run and assemble all the parts without glue. Hold the frame together with clamps and fit the sides into the frame grooves and locate the back rails. If all the parts fit and the case is square, take a measurement and cut the waist back. Then give all the parts a good sanding, and start on the assembly of the waist. You'll need to glue and assemble the frame first. Be careful to keep it square during the glue-up. When that's dry, glue the sides into the frame and screw the back rails in place. After that assembly is dry, scrape off the excess glue, sand the case, and miter the molding to fit. Also apply the waist back, using screws. You can also glue up stock for the door and cut it to fit the opening. A rabbeting bit on the router table will form the 3/8 in. by 3/8 in. lip all around the door. A 3/16 in. roundover bit will shape the outside edge of the door.

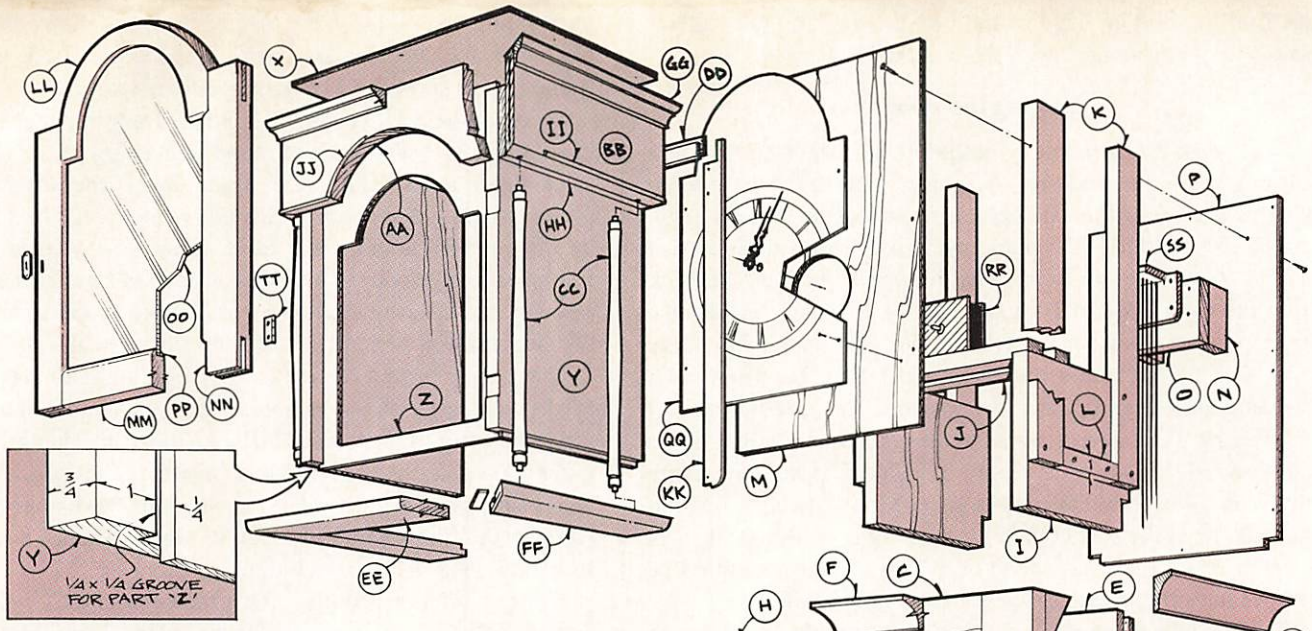
Make and Assemble Base

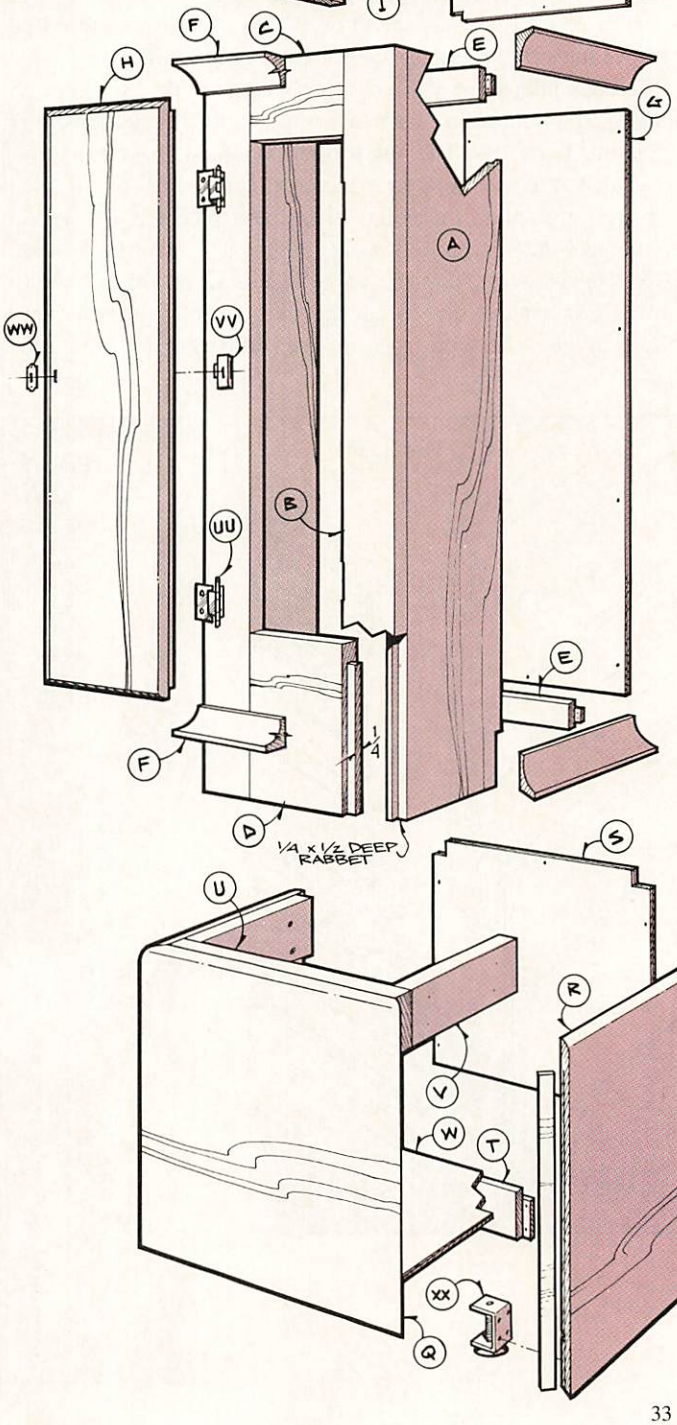
The base is a splined miter construction. Before you start, check the outside dimensions of the completed waist to see if it agrees with the elevation drawings. If not, now is the time to figure in any changes, for even a 1/32 in. discrepancy will cause problems. To insure a good fit, it's best to take the critical dimensions of the base from the completed waist.

Start by cutting the base side fillers (V) to the size listed in the Bill of Materials. Also cut the base front filler (U) to thickness and width, but leave it a little long. Then clamp the side fillers in place on the waist and hold the front filler in place against the front of the waist while you mark the precise length on one end. Use a knife or sharp scriber to get a clean, fine line. When cut to length, that front filler also becomes the guide for establishing the miters on the base front (Q).

The base front is first cut to thickness and width, and left a couple of inches long. Using test pieces, adjust your table saw blade for a perfect 45-degree miter. Establish the miter on one end of the front, then use the front filler as a gauge to establish the length of the miter. With the table saw turned off, put the base front and the front filler on the saw table, with the filler between the saw blade and the base front. By holding the filler block against the edge of the base front, you can adjust the miter to the same length. The filler should be the same length as the point-to-point distance on the inside face of the front.

Next, cut and miter the base sides (R), and cut to size the base back rail (T), the base bottom (W), and the base back (S). The back rail is rabbeted and notched on the table saw in the same





way as the waist rails made earlier. Also in the base sides and front, cut 1/4 in. wide by 1/4 in. deep grooves for the base bottom and the 1/8 in. wide by 3/8 in. deep spline grooves. When preparing the splines themselves, make sure that the grain direction agrees with the sides, as shown in Fig. 2.

With all the pieces cut, you're ready to sand the parts and assemble the base. But now is the time to make one more check to make sure the waist will fit properly inside the base. If it does, screw the front and two side fillers in place, and glue up the base. Slide in the bottom and attach the base back rail with screws. Web clamps work well for holding the assembly together.

After the glue dries, remove the clamps and clean up any glue squeeze-out. Then give the base another sanding, slide the waist into it and screw the two sections together.

With the two parts together, it's a good idea to install the four levelers (XX) so that moving the clock won't chip the base.

Install Hood Support Pieces

Before moving on to the hood itself, it's best to first install the parts that are attached to the waist and that support the movement and detachable hood, which slides on from the front. These are the four dial mount supports (K), the two guides (L), the two movement seat supports (I), and the two movement seats (J). First, cut the parts to the sizes in the Bill of Materials, then establish 3/4 in. wide by 2 1/2 in. long notches in the movement seat supports, as shown in the exploded view, and screw them in place. The notch fits over the waist back rail. Then cut 1/4 in. deep by 4 5/8 in. long notches on two of the dial mount supports, and 1/4 in. deep by 4 in. long notches on the other two dial mount supports. The longer notches are on the supports toward the front of the clock, and allow you to freely position the two movement seats.

With the notches cut, screw the dial mount supports and the guides in place. Note that because of the grain direction, you should use oversize screw holes on the hood guides to allow for seasonal wood movement. Part L is centered between parts K. The movement seats are made and screwed in place as shown on the section view. Also cut the dial mount (M) from 1/4 in. plywood. There's a 2 1/4 in. radius cutout that's centered 6 3/4 in.

up from the bottom edge of the dial mount. The hole allows access to the movement with the dial (QQ) removed.

Making the Hood

Start work on the hood by cutting to size the sides (Y) and forming the 1/4 in. wide by 1/4 in. long tongue on the bottom edge of each (see Fig. 3). Then trim the tongue back 1 1/4 in. from the front edge of the sides, much like a stopped dado. Also cut the 1/4 in. wide by 1/4 in. deep dial frame groove 1 in. back from the front edge of both sides (see exploded view detail). Next, prepare stock for the front collar (EE) and side collars (FF). Cut the pieces to thickness and width, but leave each several inches long to allow for mitering. Also establish the 1/4 in. wide by 1/4 in. deep grooves in the collars for the dial frame and hood sides (see Figs. 2 and 3). Note that the dial frame groove is 1/4 in. from the inside edge of the front collar, but that the grooves in the side collars for the tongue on the hood sides is 1/2 in. from the inside edge. You'll need to use a chisel to remove the small triangle where the grooves meet.

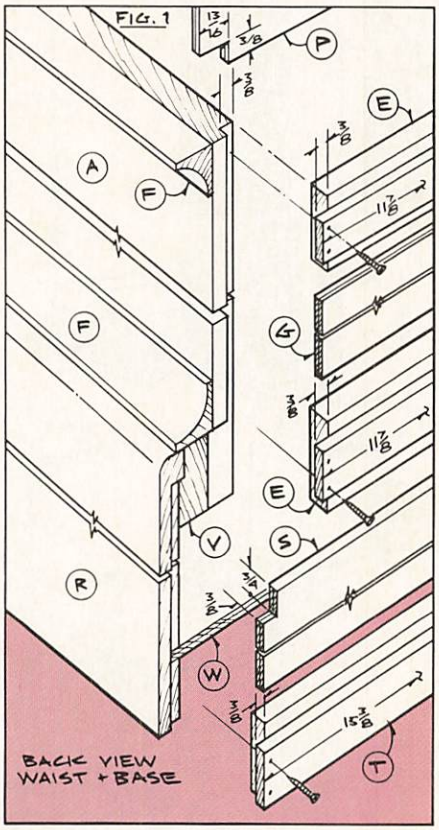
Before making the splined miter for the collar, it's a good idea to again check to make sure things will fit, and make any adjustments needed. The hood slides on and off from the front, so you need the 1/8 in. clearance we allow.

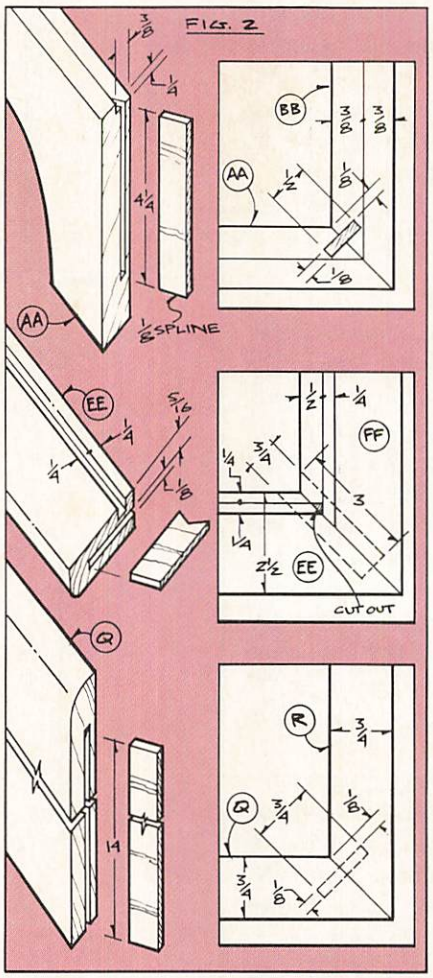
Miter and spline the collar pieces and glue them together. Now make the spacers (HH), the gallery front (AA) and sides (BB). Again work from the completed case to adjust for any errors. Use a band saw to cut the radius in the gallery front. Then cut the 1/4 in. wide by 3/8 in. deep rabbets in the gallery for the top (X), and establish the splined miters as shown in Fig. 2. Now glue the three gallery parts together. Also cut the dial frame (Z), as shown in Fig. 4, and the back rail (DD).

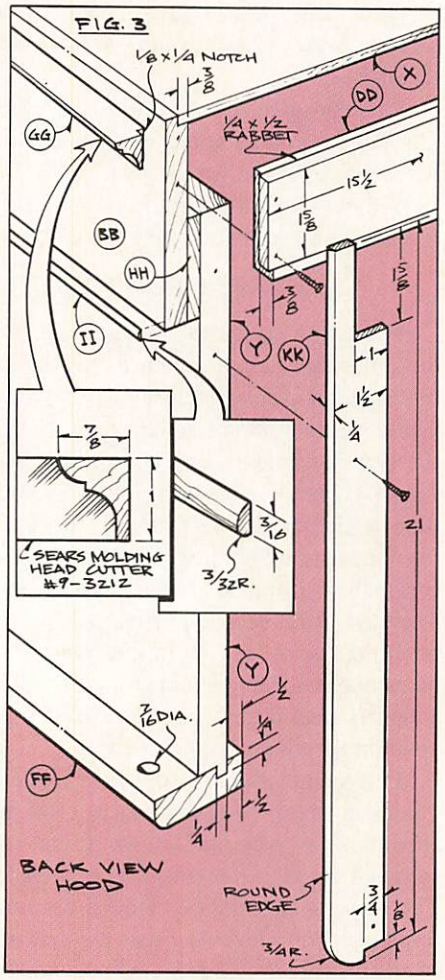
Make up the cock beading (II and JJ) from thin stock. Use a block plane and sandpaper to round both edges of 3/16 in. thick stock that's about 2 in. wide. Then rip off the 3/32 in. wide pieces. Ripping thin and narrow stock is tricky. It's best to back up the cut with a temporary table surface of 1/4 in. plywood. Clamp the plywood to the saw table, and raise the blade through it. That way the thin stock will be supported through the cut, and won't be sucked into the table saw insert.

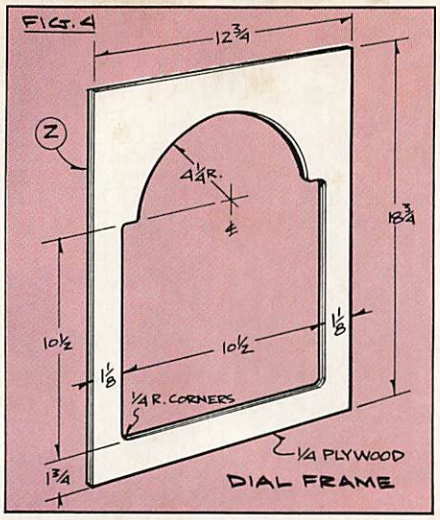
Now, steam bend a section of cock beading onto the gallery. It's best to start with the section a little long, bend it in place on the gallery front and let it cool. Then remove the clamps, cut the miters and glue the cock beading in place. That allows you to take your time with the miters. If you don't have a steam box, you can boil the section in a pan of water. About 15 minutes should be more than enough time.

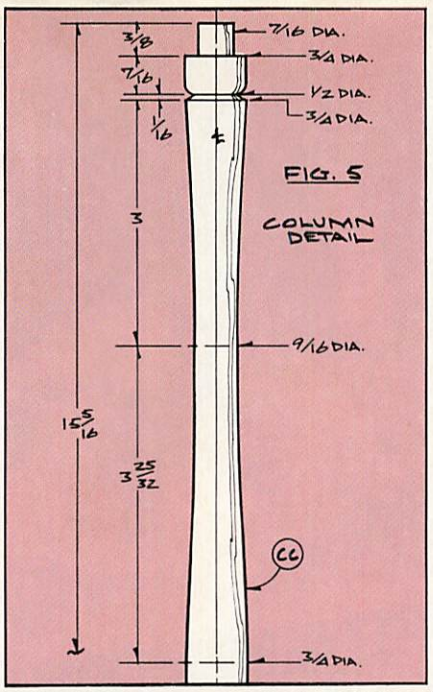
Before gluing up the hood, turn the columns (CC) (see Fig. 5) and drill the 7/16 in. diameter by 3/8 in. deep holes in the collars and the gallery and spacer assembly. Also cut the top to fit, and make up the molding (GG) using a molding head cutter in the table saw (Sears cutter no. 9-3212). With that done, you can assemble the hood. Note that the gallery sides are glued to the hood spacers, which are screwed to the hood sides from the inside. Use elongated screw holes to allow for seasonal wood movement. The dial frame isn't glued in the groove, but is left free to float.

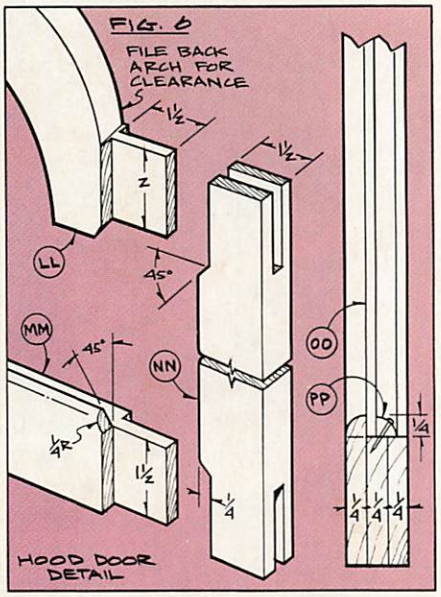


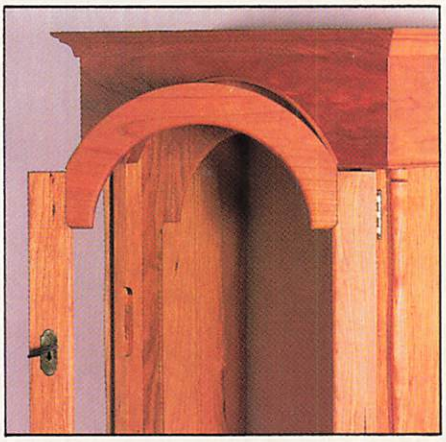












Sources

Mason & Sullivan has a package that includes all the hardware, the movement and hands, the dial, and the weights, weight shells and pendulum bob. Order part no. A0412X, which costs $219.

The individual part numbers and prices for the items in this package are:

Hardware: Part no. H6612X; $49 (includes hinges, locks, escutcheons, retainer strip for door glass and levelers).

Dial: Part no. 7421S; $12.95.

Movement: Part no. 3260X; $139 (includes hands, weight shells and bob).

Weights: Part no. 9101Y; $25.

Mason & Sullivan also has a molding package that includes the four column turnings, the four side and two front waist moldings, and all the cock beading (curved and straight). Order part no. A2262-63C, which costs $59. These parts, except for the cock beading, can also be ordered separately (call Mason & Sullivan for details).

These prices don't include shipping.

Mason & Sullivan
586 Higgins Hill Road
West Yarmouth, MA 02673
(508) 778-0475 for credit card orders
(508) 778-1056 for customer service

The hood molding is applied around the completed hood, but is notched at the back so the hood wings (KK) can run by. The wings are 1/4 in. thick stock and notched to fit around the hood back rail and over the waist molding (F). The wings are screwed to the gallery sides and the hood side collars.

Make the Door

The tombstone door uses slip joints at the corners for a strong but simple joint (Fig. 6). First make up the stiles (NN) and the upper and lower rails (LL and MM). Then cut the slip joints using a tenon jig and a dado blade in the table saw. Note that the slip joint is cut on the upper rail along the whole width of the workpiece before it's shaped into the arch, which is done on the band saw. The top and bottom radii are given on the front elevation view. Smooth the band saw cut with files or sandpaper before moving on.

Next, form the 1/4 in. radius roundovers and the 1/4 in. wide by 1/2 in. deep rabbets in the stiles and rails. You'll need a bearing-guided rabbeting bit in the router to form the rabbet along the curved upper rail. Then use a sharp chisel to miter and pare back the roundovers as shown. If you've never done this before, you may want to practice on some scrap before working on the door.

Before gluing up the door, dry-fit the parts to make sure everything fits snugly, but not too tight. If you have to force the parts together, use a file to adjust the size. Remember that the glue will swell the wood slightly when you do the glue up. It's also a good idea to have the door glass (OO) on hand. A local glass shop will cut it to size. The parts package for the clock includes a flexible plastic retainer strip (PP) and brads.

Finishing Up

Before finishing, mortise for and mount the hood door butt hinges (TT) and the waist offset hinges (UU). The locks (VV) are flush mounted, but you'll need to cut notches in the waist stile and hood side so the latches will catch. Then mount the escutcheons (WW).

For a finish, we used tung oil, which is durable and easy to apply (see Tung Oil on page 21). The clock should be well sanded up to 220- or 320-grit paper and all dust removed with a tack rag. Tung oil requires three or four coats.

The movement (RR) has built-in clamps that fit over the movement seat. With the movement in place, it's an easy matter to locate the dial, which is screwed to the dial mount.

The back (P) is cut to fit with the hood in position over the waist. Cut the chime mount spacers (N) and the chime mounts (O), and fasten the chimes (SS) to part (O) before assembling the spacers and the mount to the back.

English Garden Set

Garden furniture has long been popular. And over the years all types of materials have been used, from cast iron and aluminum to plastic, steel and wicker. Still, from a standpoint of comfort and beauty, it's hard to beat wood.

If there's one major drawback to using wood, it's durability. Unless it's carefully maintained, most wooden furniture that remains outdoors year-round won't last more than about a decade. Redwood lasts longer than pine, but eventually it too begins to decay. But there is one popular exception to the short life expectancy problem that flaws most exterior wooden furniture. The exception is teak.

Teak is a tropical hardwood with great natural resistance to weather and decay. Its use in exterior applications from construction to boatbuilding is well established. And for many years it's been a favorite for English garden furniture. Freshly cut teak has a lovely orange-brown color that weathers to a silver gray if left unprotected.

We've included three teak projects in this issue: a Garden Table, a Garden Chair, and a Planter. The total material cost for us at $7.33 a board foot was about $750, but you may be able to find teak for less. Our cost included material for two chairs. You could select a less expensive wood for your English Garden Set, but for a classic project like this, we felt that teak was well worth the cost.

Working With Teak

Teak is a little lighter in weight than white oak, but it's one of the roughest, most abrasive woods on tools. Carbide cutting edges are strongly recommended. You can cut teak with high-speed steel tools (it was done that way until carbide was developed), but you'll need to resharpen frequently. We used high-speed steel cutters in both our

jointer and planer, and found that about halfway through these three projects we had to change the blades. If you can afford carbide jointer and planer knives, they are the best choice. Since teak has a high oil content, you should also regularly clean the gum buildup from behind the cutting edges.

The other major difference in working with teak rather than the domestic hardwoods is the selection of glue. The oil in teak can prevent a good bond with many adhesives, even those—like plastic resin—that are recommended for outdoor use. Based on our shop-tests (see Woodworking Basics, page 18), we suggest only one specific brand of adhesive, T-88 Epoxy. Be sure to carefully follow manufacturer's instructions and safety precautions when working with this epoxy.

The Finish

The finish we used on our table, chairs and planter is Deks Olje #1 matte finish. It's specially formulated for teak and other woods used in boatbuilding, so it's designed to withstand the weather. But the application procedure is rather lengthy, and it's important to follow instructions carefully. If you can't find Deks Olje locally, a mail-order source for it is Jamestown Distributors, 28 Narragansett Ave., Jamestown, RI 02835, Tel. (800) 423-0030.

GARDEN TABLE

The Garden Table is mainly mortise and tenon work, with some compound angle cuts and a little shaping thrown in. We've added brass threaded inserts at a few of the joints to give the table a knock-down capability. This makes it convenient to store in winter and easier to move.

All the wood parts, except for the slats (C) and spacer blocks (D), are 1 3/4 in. thick. If you buy 8/4 in. thick rough-sawn teak, after jointing and surfacing you'll have about 1 3/4 in. thickness. Try to pass all your material through the planer at the same 1 3/4 in. setting. This will make the job of cutting your mortises and tenons much easier.

A good place to start is with the top. It's basically a big frame with two sides (A), two ends (B), and a series of slats separated by spacer blocks. Note that the mortises and tenons that join the sides and ends are slightly off-center relative to stock thickness (Fig. 1). This allows for the tongue-and-groove joint that's used to capture the slats.

To cut the mortises in the ends, use a drill press equipped with a fence and a 1/2 in. diameter bit to rough out most of the waste. Then clean up the mortise sides and ends with a chisel. If you have one, a mortising attachment for the drill press is another option. Then cut the tenon on the sides and the groove in the sides for the slats. The tenon shoulders are established on the table saw, but the cheek cuts are made by hand. Clamp the sides vertically in your bench vice and make the cheek cuts with a sharp handsaw. We used the ripping side of a Japanese *ryoba* saw (see In The Shop, page 12).

The groove in the sides for the slats is cut on the table saw using a dado head. Note that the groove is 1/16 in. deeper than the length of the corresponding tongue cut on the slat ends. This extra 1/16 in. insures that the shoulders of the slats will be flush, and also allows for some glue squeeze-out when you add the spacer blocks.

Next, cut all the slats and spacer blocks. Take extra care when setting up to rip the slats to the 2 in. width, and when establishing the 1/4 in. thickness of the spacer block stock. If you are off a little on either of these dimensions, you'll run into assembly trouble. Note that for the spacer blocks you should start with 1/4 in. thick stock. Then rip 3/8 in. wide strips, and finally crosscut the strips to get the 9/16 in. length.

The roundover and bevel on the top are both established after the top is assembled. The assembly is a little tricky, so you'll need to follow our instructions carefully. Start by doing a dry assembly just to be sure everything fits. If the slats and spacer blocks exceed the 29 1/2 in. space between the ends, you can shave a little off one or more of the slats and blocks. But don't remove too much from any one of the slats or blocks, or you'll risk upsetting the symmetry.

Start the actual assembly by inserting both sides into one end, but without any glue on the joints. Next, add a pair of the spacer blocks and a slat followed by another pair of blocks and another slat. Use a little glue to hold the spacer blocks, but don't use any glue on the slats. Repeat this procedure until all the slats and blocks are in place. Now glue the two ends onto the slat, side and spacer block assembly.

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Side	1 3/4 x 3 1/2 x 32 1/2*	2
B	End	1 3/4 x 3 1/2 x 36 1/2	2
C	Slat	3/4 x 2 x 30 1/2	13
D	Spacer Block	1/4 x 3/8 x 9/16	28
E	Top Stretcher	1 3/4 x 2 1/2 x 48	2
F	Leg	1 3/4 x 1 3/4 x 25*	4
G	Bottom Stretcher	1 3/4 x 2 3/4 x 48	2
H	Brass Threaded Insert	1/4-20**	8

* Length includes tenons

** Available from Woodcraft, 210 Wood County Industrial Park, Parkersburg, WV 26102, Tel. (800) 225-1153. Order their part no. 12K51. Cost is $7.50 postpaid for a box of 25.

When dry, use the router with a 1/4 in. radius roundover bit to round the upper edge of the top. We used the table saw to cut the 30-degree bevel on the top's four sides, but you'll need an extension table because of the size of the top. If you aren't set up with a large extension table, you can make the bevel with a 7 1/4 in. portable circular saw. Angle the blade 30 degrees, and clamp a guide strip to gauge the saw base against. As shown in the Bevel Detail, the bevel cut should start just below where the roundover ends. After the bevel has been cut, you'll need to do some filing and sanding to shape the transition between it and the roundover.

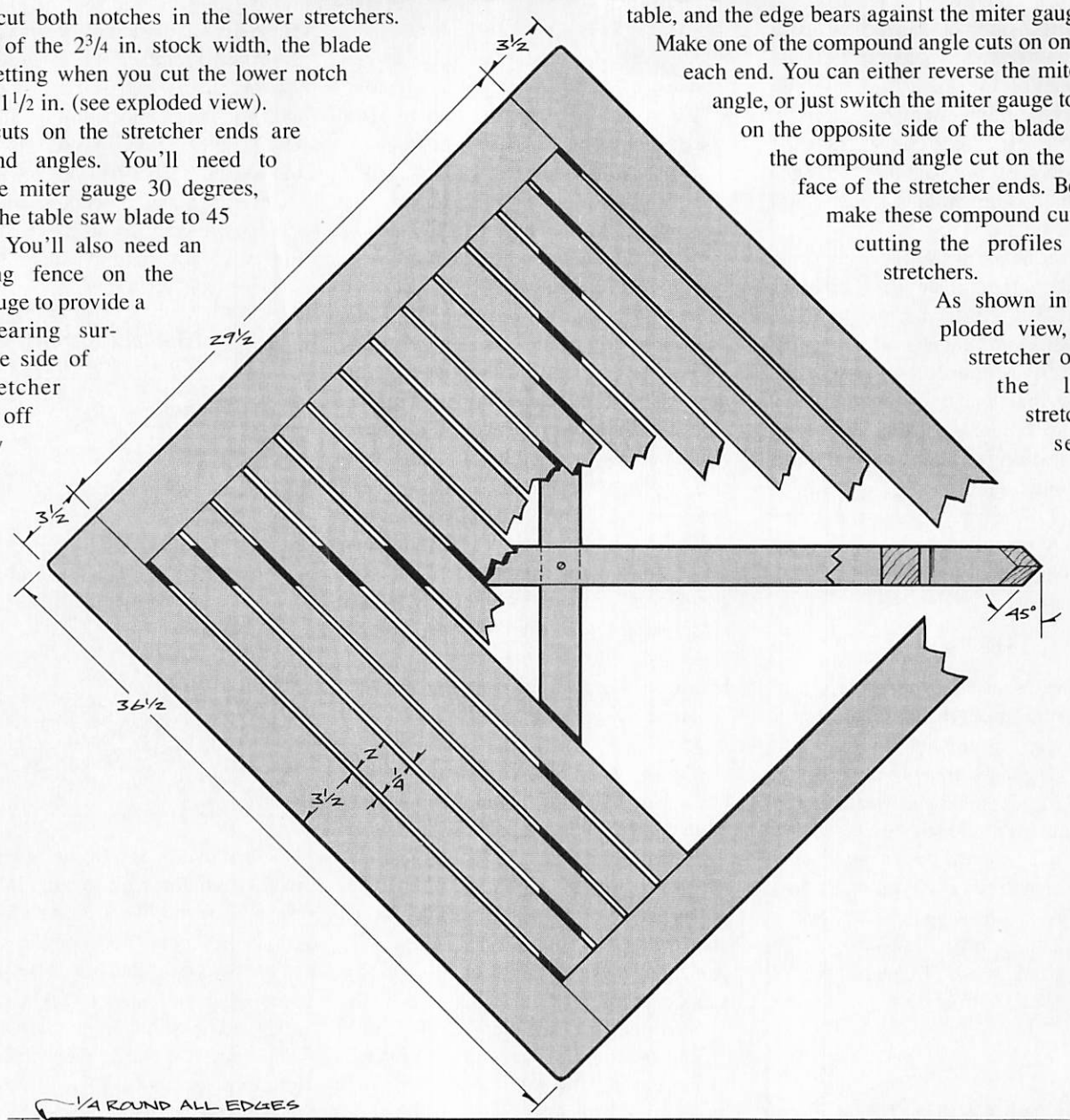
The leg (F) and stretcher (E, G) assemblies are more mortise and tenon work. But note that the top stretchers are 2 1/2 in. wide, while the bottom stretchers are 2 3/4 in. wide. The extra 1/4 in. on the bottom stretchers is purely an aesthetic element; it balances the stretchers' appearance given the 1/4 in. reveal that creates the foot.

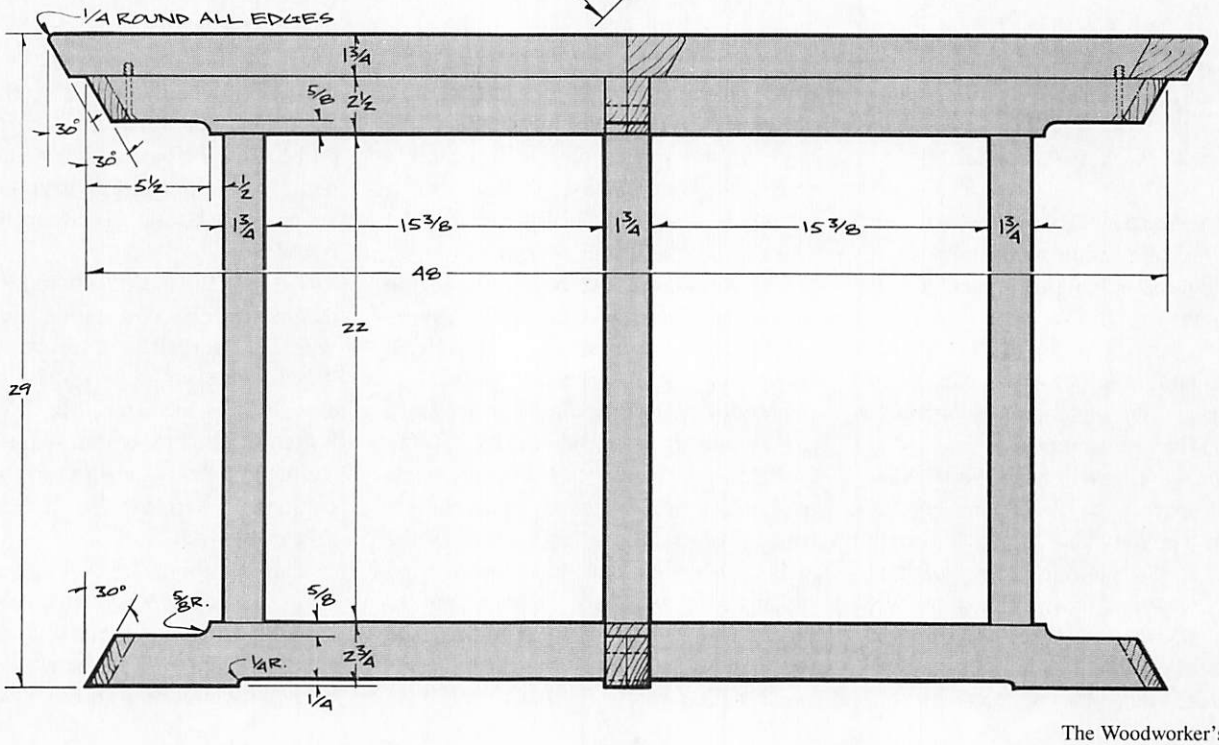
Half-lap joints interlock the stretchers. The joint where the two upper stretchers meet is simple, requiring just a 1 1/4 in. deep by 1 3/4 in. wide notch in each piece. But don't use the same setup

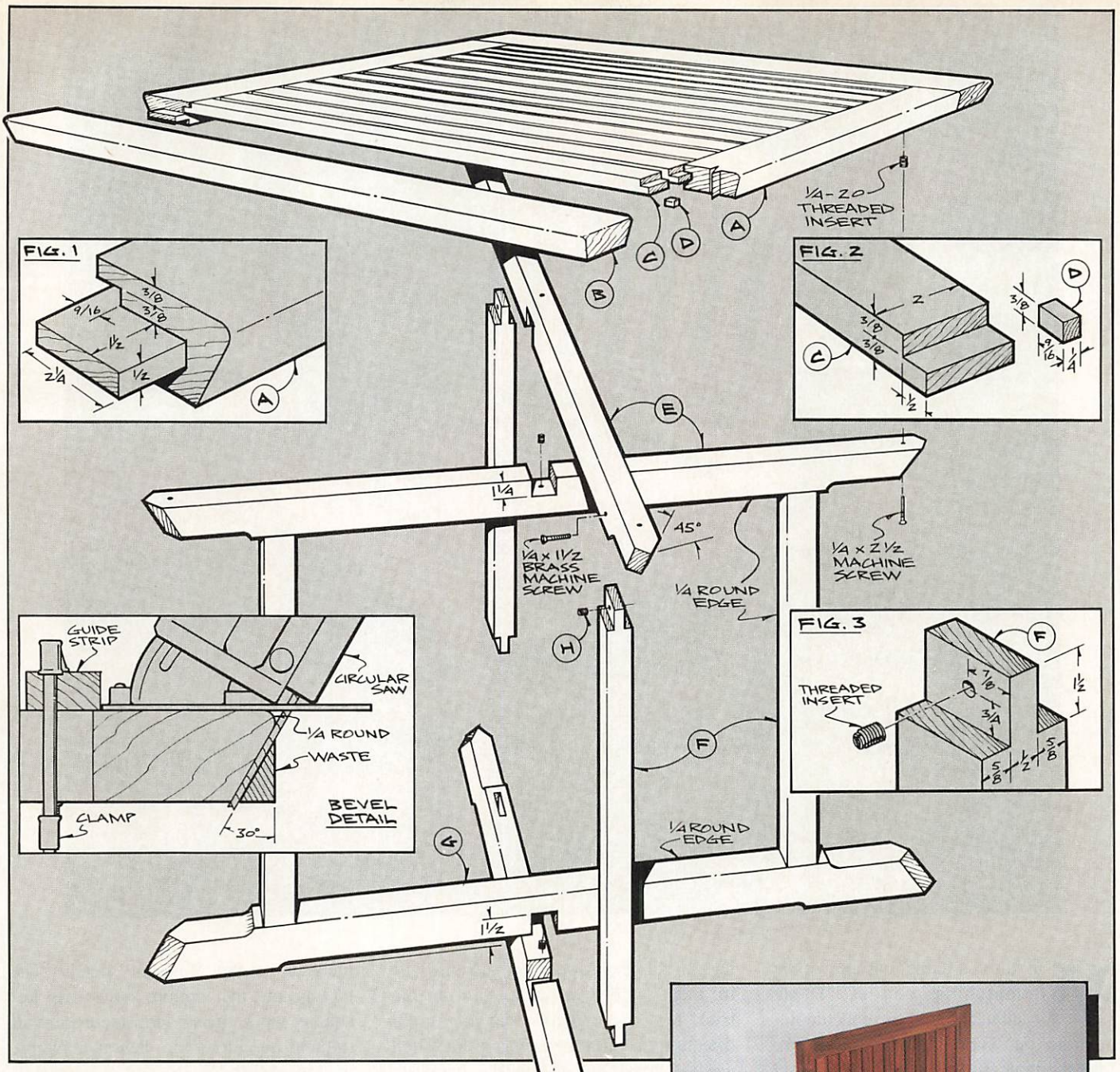
to also cut both notches in the lower stretchers. Because of the 2¾ in. stock width, the blade height setting when you cut the lower notch must be 1½ in. (see exploded view).

The cuts on the stretcher ends are compound angles. You'll need to angle the miter gauge 30 degrees, and tilt the table saw blade to 45 degrees. You'll also need an extra-long fence on the miter gauge to provide a good bearing surface. The side of the stretcher gauges off the saw table, and the edge bears against the miter gauge fence. Make one of the compound angle cuts on one side of each end. You can either reverse the miter gauge angle, or just switch the miter gauge to the slot on the opposite side of the blade to make the compound angle cut on the opposite face of the stretcher ends. Be sure to make these compound cuts before cutting the profiles on the stretchers.

As shown in the exploded view, the top stretcher of one of the leg-and-stretcher assemblies







uses knock-down hardware instead of glue at the mortises and tenons. As the detail shows (Fig. 3), a threaded insert (H) is inserted into the tenon. A machine screw through the side of the mortise provides the mechanical strength. Be sure to use the knock-down hardware on the top stretcher that has the half-lap notch cut into the lower edge.

Round the various edges as indicated, glue the fixed leg-and-stretcher and the bottom half of the other leg-and-stretcher assemblies, and add the removable top stretcher. Note that we also used threaded inserts at the half-lap stretcher joints, in addition to those at the mortises and tenons. Lay the completed top upside down on a non-marring surface (cardboard or an old blanket work well), position the completed base assembly on it, and drill for the remaining machine screws and threaded inserts that join the base to the top.

Garden Chair

What's a table without some matching chairs? These chairs are the perfect complement to our Garden Table (page 36). Like the table, they're made of teak, and are glued with an epoxy (T-88 brand) that's specially formulated for oily woods. You'll want to refer to the Gluing Oily Woods feature on page 18, and to the discussion of the working qualities of teak on page 36 before starting this project. If you make the chairs from redwood or some other non-oily wood, you'll only have to worry about using a waterproof glue, such as resorcinol.

Note that the quantities shown in our Bill of Materials are for making one chair. Adjust the number of parts as required by the number of chairs you decide to make.

Start with the legs (A, B). The front legs are $1\frac{3}{4}$ in. square, but for the back legs you'll need to start with a board $1\frac{3}{4}$ in. thick by $3\frac{3}{4}$ in. wide. Lay out the back legs (note arrow showing grain direction) to minimize short grain. Then use the band saw to cut the back leg profile. The various rail mortises in the legs can all be roughed-in with a drill press equipped with a $\frac{1}{2}$ in. diameter bit, or with a $\frac{1}{2}$ in. mortising bit. As shown in the elevation views, the rail mortises are all centered on the legs. The mortise for the upper back rail (H) starts 2 in. down from the end of the back leg, and the mortise for the lower back rail (G) is located 16 in. from the same end. Note that the mortises for the side seat rail (E) and front and rear seat rails (F) are cut through to intersect. All the mortises for the rails are cut $1\frac{1}{8}$ in. deep, so there won't be a problem with the tenon shoulders on the rails fitting snug to the legs at assembly time. The tenons on the seat rails and bottom rails (D) are identical except for one detail. The tenons on the bottom rails are left square, while the seat rail tenons are all mitered to allow for clearance where they meet (Fig. 1).

The trickiest mortise to cut is the mortise in the back leg for the tenon on the end of the arm (C). This mortise must be cut at an angle, so you'll need to either tilt the drill press table 10 degrees, or use a 10-degree wedge to properly position the stock. The easiest way is to use the wedge, since you won't have to worry about resetting the drill press table back to 90-degrees. The tenon on the end of the arms (Fig. 2) is best cut by hand with a dovetail saw.

Also cut the mortise and tenon joint that attaches the front legs to the arms (Fig. 3), and the mortise and tenon joints that join the back slats (I) to the back rails. We used individual mortise and tenon joints (Fig. 4) for the back slats,

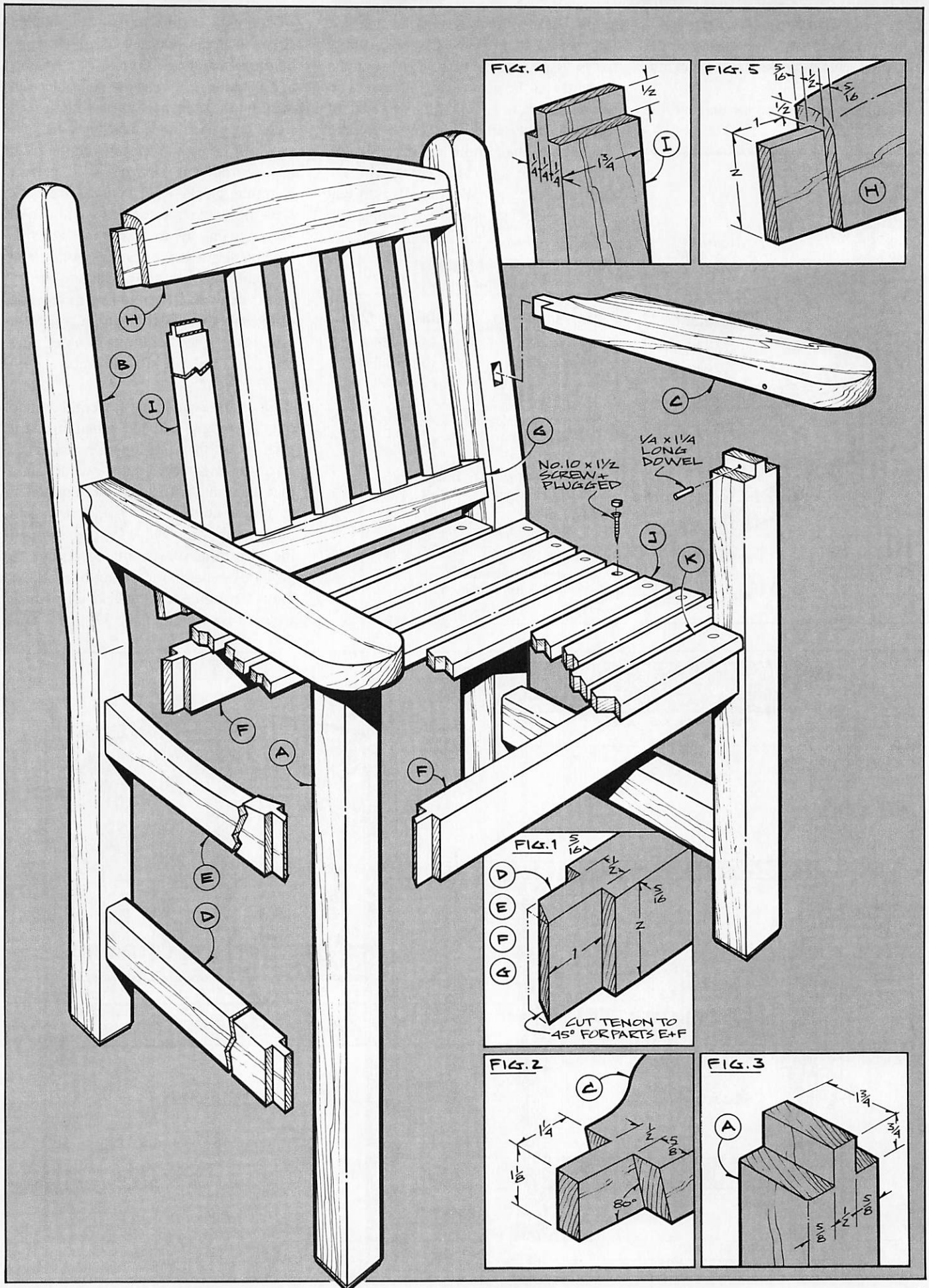
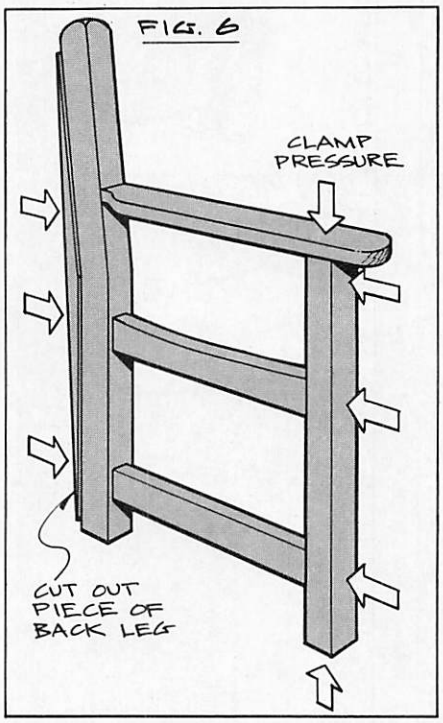


FIG. 4
1½
I
¼ ¼ ¼
1¾
FIG. 5
5/16
½
5/16
1½
1
2
H
H
B
I
C
G
No.10 x 1½ SCREW + PLUGGED
¼ x 1¼ LONG DOWEL
J
K
F
A
F
E
D
FIG. 1
5/16
½
5/16
D
E
F
G
2
1
CUT TENON TO 45° FOR PARTS E+F
FIG. 2
C
1¼
½
⅝
1⅛
80°
FIG. 3
1¾
A
¾
1
⅝
½
⅝

but an acceptable alternative is to cut a 1/4 in. wide by 1/2 in. deep groove in the back rails, and then use filler blocks to separate the back slats.

Be sure to cut the tenons on both the upper back rail (Fig. 5) and the side seat rail before shaping the curves on these parts. A 34 in. radius curve is cut on the top edge of the upper back rail, and a 50 in. radius curve is cut on the top edge of the side seat rails. The seat rail curve makes the chair more comfortable. As shown in the top view of the arm, the arm profile is just a series of radii that can be easily laid out with a compass.



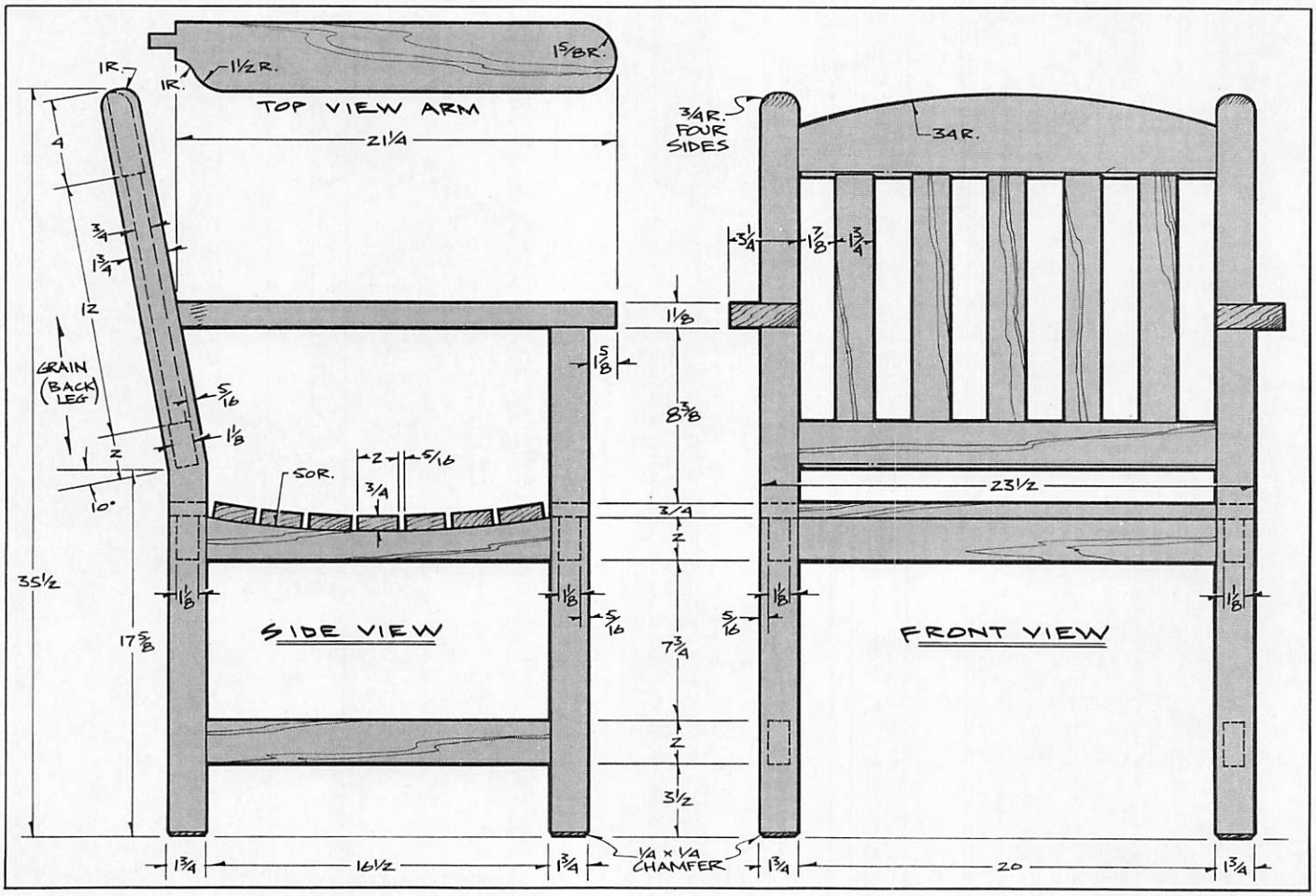
Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Front Leg	1 3/4 x 1 3/4 x 25 1/8*	2
B	Back Leg	1 3/4 x 3 3/4 x 35 1/2**	2
C	Arm	1 1/8 x 3 1/4 x 22 1/2*	2
D	Bottom Rail	1 1/8 x 2 x 18 1/2*	2
E	Seat Rail (side)	1 1/8 x 2 x 18 1/2*	2
F	Seat Rail (front, rear)	1 1/8 x 2 x 22*	2
G	Back Rail (lower)	1 1/8 x 2 x 22*	1
H	Back Rail (upper)	1 1/8 x 4 x 22*	1
I	Back Slat	3/4 x 1 3/4 x 13*	5
J	Seat Slat (long)	3/4 x 2 x 23 1/2	7
K	Seat Slat (short)	3/4 x 1 3/4 x 20	2

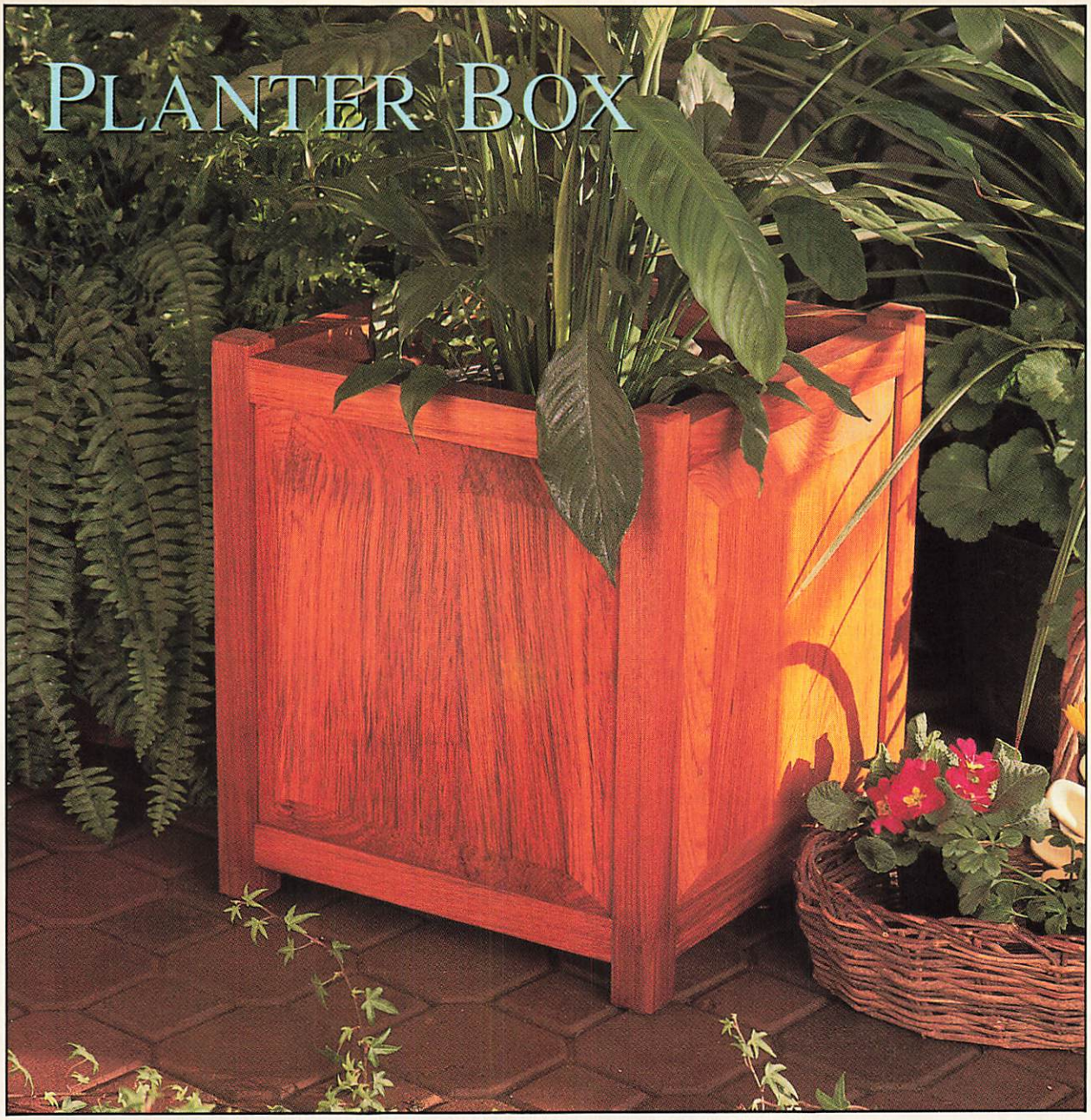
* Length includes tenon(s)
** Width is before shaping

Apply the various roundovers, and the chamfer at the bottom end of the legs, before assembling the chair. The assembly is done in sections. Assemble an arm, side seat rail and bottom rail to each front leg. Then add each back leg. As shown (Fig. 6), the waste from the back leg profile cut serves as a perfect clamping block. The back rails and back slats are another separate assembly. All that remains is to join the two side assemblies with the back assembly and front and rear seat rails. The only tricky part is that you'll need to first mount one of the short seat slats (K) to the rear seat rail. There's no room to drill holes after the back rail-and-slat assembly is in place.

Once the seat frame is complete and out of clamps, add the remaining seat slats. Note that the long seat slats (J) mount to the curved side seat rails, and that the remaining short slat is mounted to the front seat rail. Use screws and plugs as shown. Add dowel pins through the arms into the front leg tenons to provide some extra strength at those joints. A source for the Deks Olje finish we used is given on page 37.



PLANTER BOX



This handsome planter completes our teak Garden Set. Don't be afraid to adjust the planter size to fit your containers. Our planter features an adjustable shelf, and can accommodate a pot as large as 14 in. diameter.

You don't have to use teak for the planter, but from a standpoint of longevity, it's an excellent wood for outdoor projects. If you do use teak, be sure to read our article, Gluing Oily Woods, on page 18 of this issue. Our shop-test found T-88 brand epoxy to be the strongest glue for teak. You'll also want to read about the problems that can be encountered when machining teak, as explained on page 36.

The planter consists of four posts (A), connected by rails (B), with raised panel sides (C), and an adjustable shelf (D, E). The adjustable shelf can be raised or lowered by relocating dowel pin supports set in holes drilled into the posts.

Start by cutting stock for the posts and rails. Eighteen feet of 1 1/2 in. square stock will yield all the posts and rails. As shown in Fig. 1, the rail mortises are cut through to intersect. Note that the groove for the raised panel sides is off-center relative to the rail thickness and the post thickness and width. This was done to provide room at the inside of the posts for the dowel pins that support the adjustable shelf.

The easiest way to cut the 1/4 in. wide by 3/8 in. deep groove for the sides is on the router table. Use a 1/4 in. diameter straight cutter and set up stops for the post grooves. If your router table isn't big enough to use stops for a piece this long, just make indexing marks on the sides of the posts to serve as a guide. Don't try to achieve the full 3/8 in. groove depth in a single pass. It's best to make three passes, removing about 1/8 in. of material each time.

The groove in the rails is not stopped. Just run it the full length of the rails, and then cut the tenons. As shown in Fig. 2, the tenons are mitered to provide clearance where they meet. Although the detail shows a 1 in. length at the point of the miter, in practice it's best to cut the miter so the tenon length is about 1/32 in. less than the mortise depth. This eliminates any chance of the tenon shoulders not fitting tight to the posts.

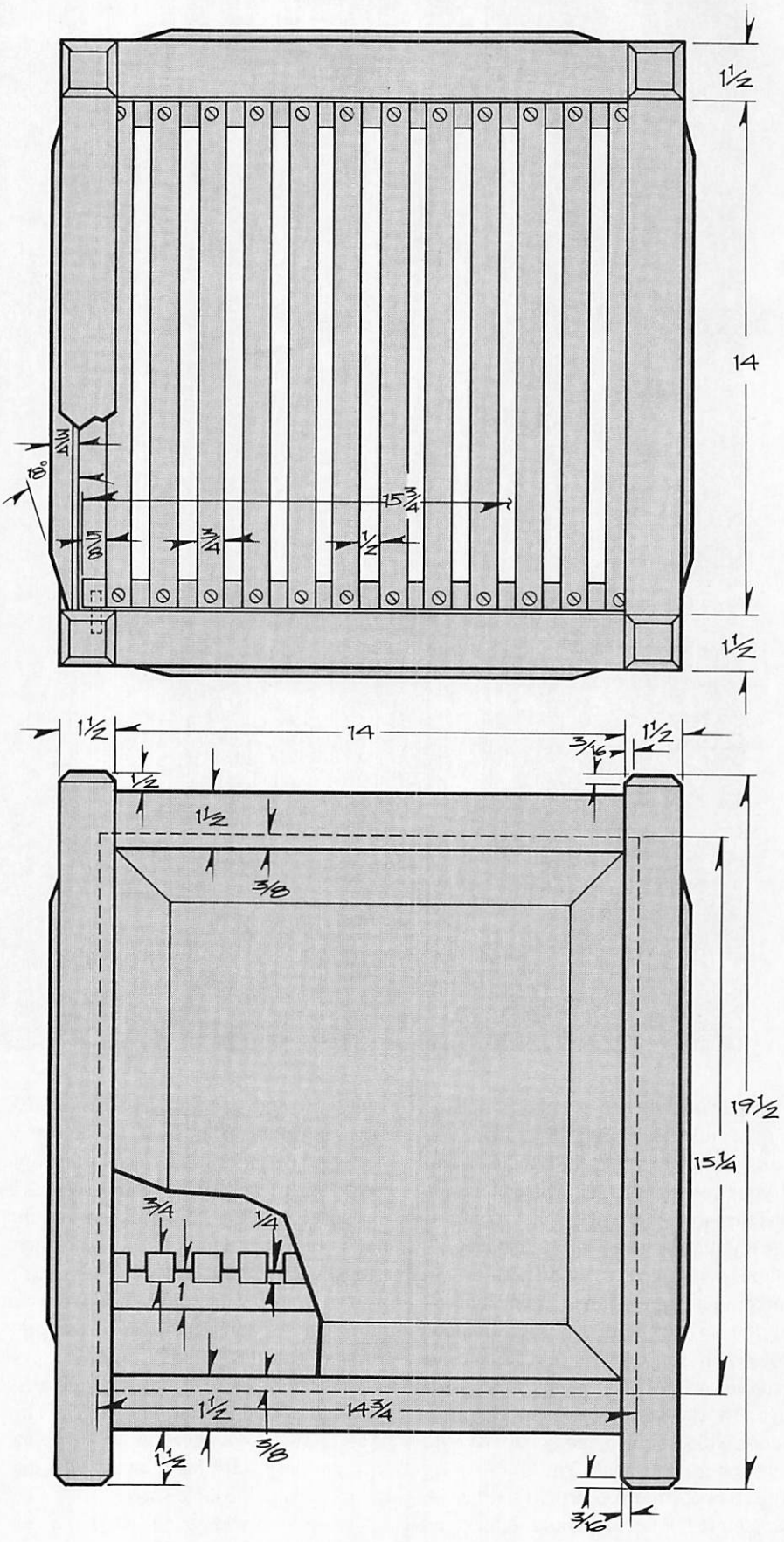
Next, drill for the 1/4 in. diameter by 1 1/8 in. long shelf support dowel pins. In order to get the hole spacing in each of the posts to agree, it's best to use a template. Make the template out of 1/4 in. thick plywood, 1 1/2 in. wide by 19 1/2 in. long. When you clamp the template in place flush with the post ends and edges, you are ensured that the dowel holes will be drilled in the correct location. After the holes are drilled, apply the 3/16 in. chamfer to the ends of the posts.

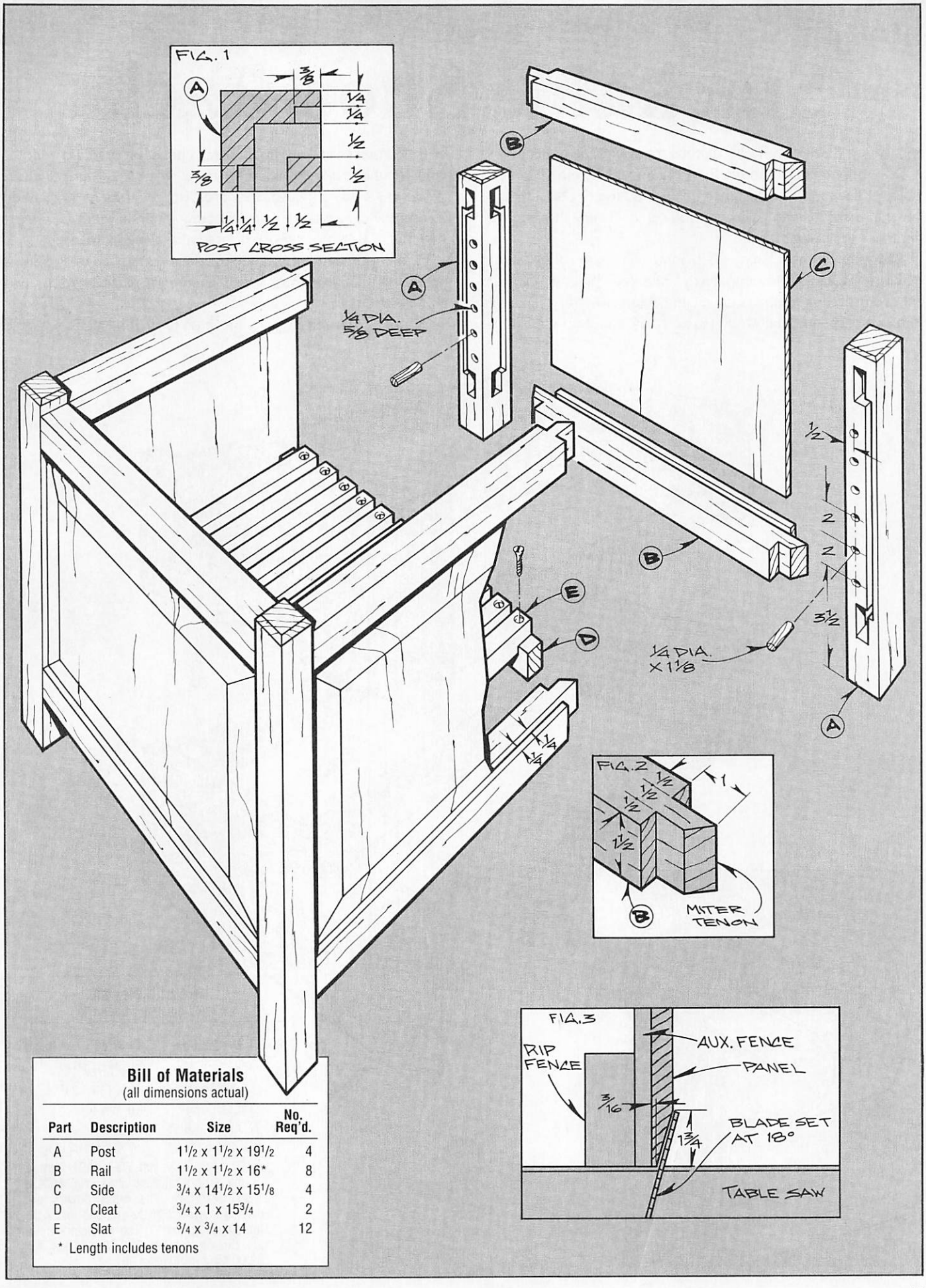
As shown in Fig. 3, the raised panel sides are cut on the table saw, gauging off a high auxiliary fence. Tilt the blade 18 degrees and adjust the fence so that the thickness at the edge is 3/16 in. After sanding, your thickness at the edge should be about 5/32. If you size the raised panel sides so they extend about 1/4 in. into the 3/8 in. deep grooves in the posts, you'll leave enough space to allow for seasonal wood movement. Since there won't be much movement top-to-bottom, we sized the panel to allow only 1/8 in. extra space on the rail groove-to-rail groove dimension.

Assemble a pair of rails and posts to each of two raised panel sides, then join those assemblies with the remaining rails and sides. Use glue at the mortise-and-tenon joints, but not on the sides. Since the sides are solid panels, they must be free to move. Drill for and insert a small brad at the rail center point both top and bottom to equalize the movement in the sides.

Make the adjustable shelf as shown. There are a number of ways to cut the 1/4 in. deep by 3/4 in. wide slat dadoes in the cleats. But with most techniques you'll need to be concerned that the dadoes in the two cleats are in register. A simple way to avoid this concern is to start with a piece for the cleats that measures 1 in. thick by 1 5/8 in. wide by 15 3/4 in. long. Cut the dadoes, then rip the piece down the middle to get two perfectly matched cleats. If your table saw blade cuts a 1/8 in. wide kerf, you'll end up with two 3/4 in. thick by 1 in. wide cleats. Set up a stop on the drill press to pre-drill the screw holes in the slats, and be sure to use brass or stainless steel screws to avoid rust.

We used Deks Olje matte finish (see page 37 for source) on the planter. WWJ





Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Post	1 1/2 x 1 1/2 x 19 1/2	4
B	Rail	1 1/2 x 1 1/2 x 16*	8
C	Side	3/4 x 14 1/2 x 15 1/8	4
D	Cleat	3/4 x 1 x 15 3/4	2
E	Slat	3/4 x 3/4 x 14	12

* Length includes tenons

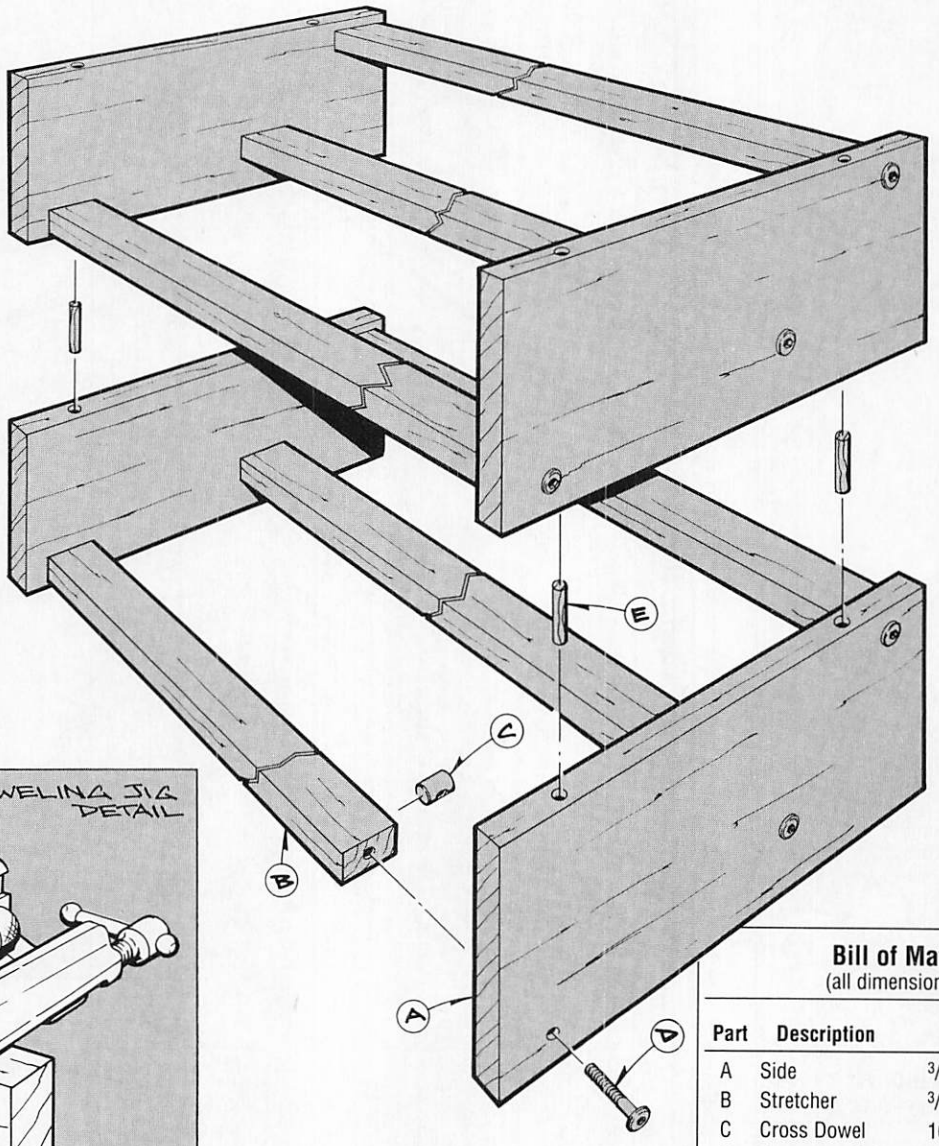
Stackable Shoe Rack

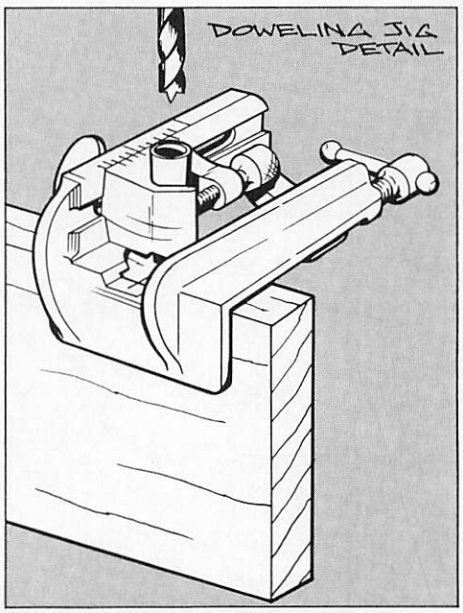
You don't have to be famous for your shoe collection to appreciate a handy closet organizer like our shoe rack. The racks are designed to stack on top of each other, so you can make as many as need. You can also vary the length of the racks to fit your closet.

The pine lumber and steel joint-connector construction makes these racks light but sturdy. And they're easy. The joint connectors employ a cross dowel and connector bolt to securely join two perpendicular wood parts. To mount them you simply drill two holes, a shank hole for the connector bolt and a larger hole for the cross dowel. It's a new wrinkle on an old idea. Wood cross dowels have been used for generations to provide a secure anchor when driving a screw into end grain. The steel variety allows you to easily disassemble the shoe racks.

First cut the sides (A) and stretchers (B) to the sizes shown on the Bill of Materials. We list enough parts to make two complete racks.

With the parts cut to size, move on to drilling the holes. Use





Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Side	3/4 x 5 1/2 x 11 3/4	4
B	Stretcher	3/4 x 1 1/4 x 34 1/2	6
C	Cross Dowel	16 mm *	12
D	Connector Bolt	40 mm *	12
E	Locating Pin	3/8 dia. x 1 1/4 long	4

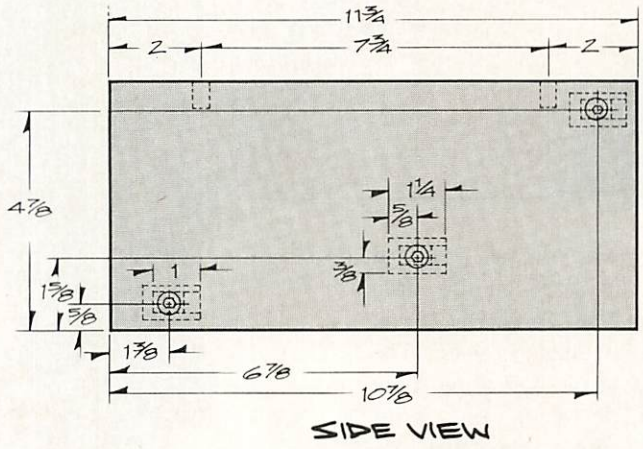
* Available from Garrett Wade, 161 Avenue of the Americas, New York, NY 10013, 1-800-221-2942. The cross dowels are catalog number Q20.02 and sell for $4.90 for a package of 10. The connector bolts are catalog number Q12.02 and sell for $2.90 for a package of 10.

the elevation drawing to locate the hole centers on the sides. A drill press or a drill stand will help to make the holes perpendicular.

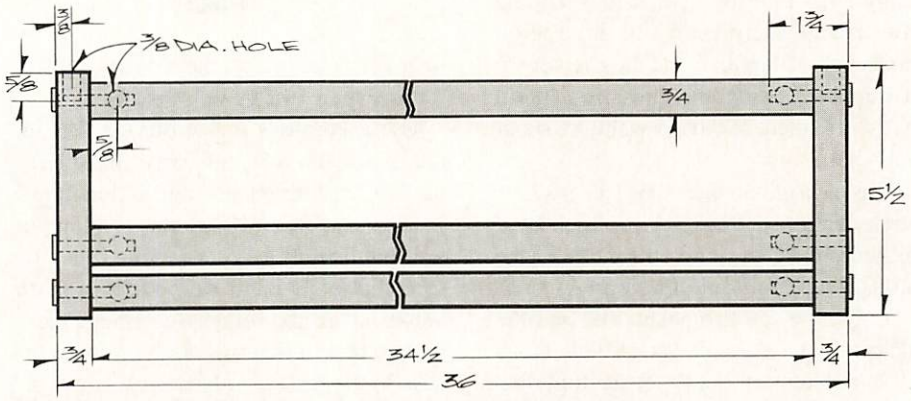
Next, use a doweling jig to drill the intersecting holes in the stretchers for the cross dowels (C) and connector bolts (D), as well as the holes in the edges of the sides for the locating pins (E). Note that the cross dowels require a 3/8 in. diameter by 1 in. deep hole. The connector bolts require a 1/4 in. diameter by 1 3/4 in. deep hole. Be careful about locating the centers so the holes intersect neatly.

Once the parts are cut and holes drilled, use 150-grit sandpaper to remove any saw marks and slightly round over, or break, the edges. Pay special attention to the end grain, which usually takes more sanding. When the saw marks are gone and the pieces are well sanded overall, switch to 220-grit paper and sand the pieces again. To assemble, insert the cross dowels into their sockets and screw in the connector bolts. Make them good and tight so the stretchers don't turn in use.

We finished the shoe racks with two coats of spray polyurethane varnish. It's quick and leaves a durable finish.



SIDE VIEW



FRONT VIEW

Victorian Wall Shelf

Perhaps you've already imagined what you'd place on this little Victorian Wall Shelf. But if you haven't got a use in mind, no matter. The shelf makes a great gift, and only requires minimal stock. The scroll brackets look complex, but they are easily cut, either by hand with a coping saw or with a scroll saw. All three scroll brackets are identical, and they're simple to duplicate using the full-size pattern that's provided. We used walnut for our wall shelf.

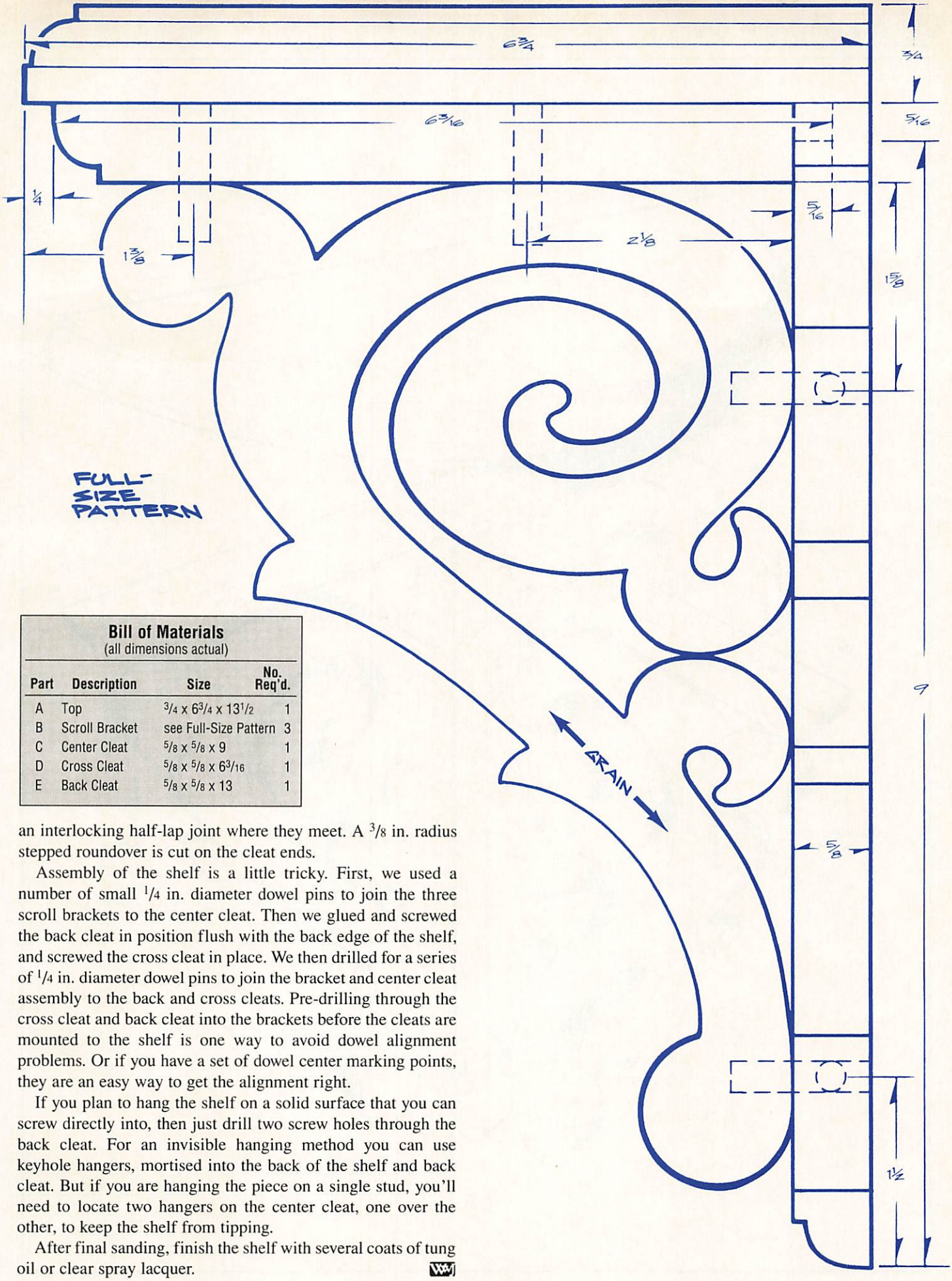
This is a great one-board project. A single length of stock, 3/4 in. thick by 7 in. wide by 42 in. long will yield all the parts. Note that while the top (A) is 3/4 in. thick, the scroll brackets (B) and the cleats (C, D, E) are all 5/8 in. thick. Cut a 13 1/2 in. length of board for the top, then reduce the remaining stock to 5/8 in. thick. If you don't have a power jointer or planer, a hand plane will quickly remove the extra 1/8 in. of material.

Use a compass to lay out the 6 3/4 in. radius for the top, cut very carefully to the line with the band saw, and then use the router with a 3/8 in. radius beading bit to establish the molded edge. Just be sure that your band saw cut is smooth before using the router. Any raggedness in the cut will be translated into unevenness in the molded edge.

Using a piece of carbon paper, trace our full-size scroll pattern directly onto the bracket stock. But take note of the grain direction. The scrolls should be laid out so the grain runs as shown to give the brackets maximum strength. Also note that the scrolls have small flats where they contact the cleats. These flats provide some glue surface later on during assembly. You may find it easier to drill the various dowel holes in the brackets before cutting the scrolls.

Use as fine a blade as possible to cut the scroll brackets. A fine blade and careful cutting will mean less sanding or filing, which is difficult given the narrow open area within the scrolls. We used small flat and half-round files to smooth the interior curves.

The center cleat (C) joins the three scroll brackets, while the cross cleat (D) and back cleat (E) mount the scroll bracket assembly to the shelf. As shown in the exploded view, the cleats employ



Bill of Materials
(all dimensions actual)

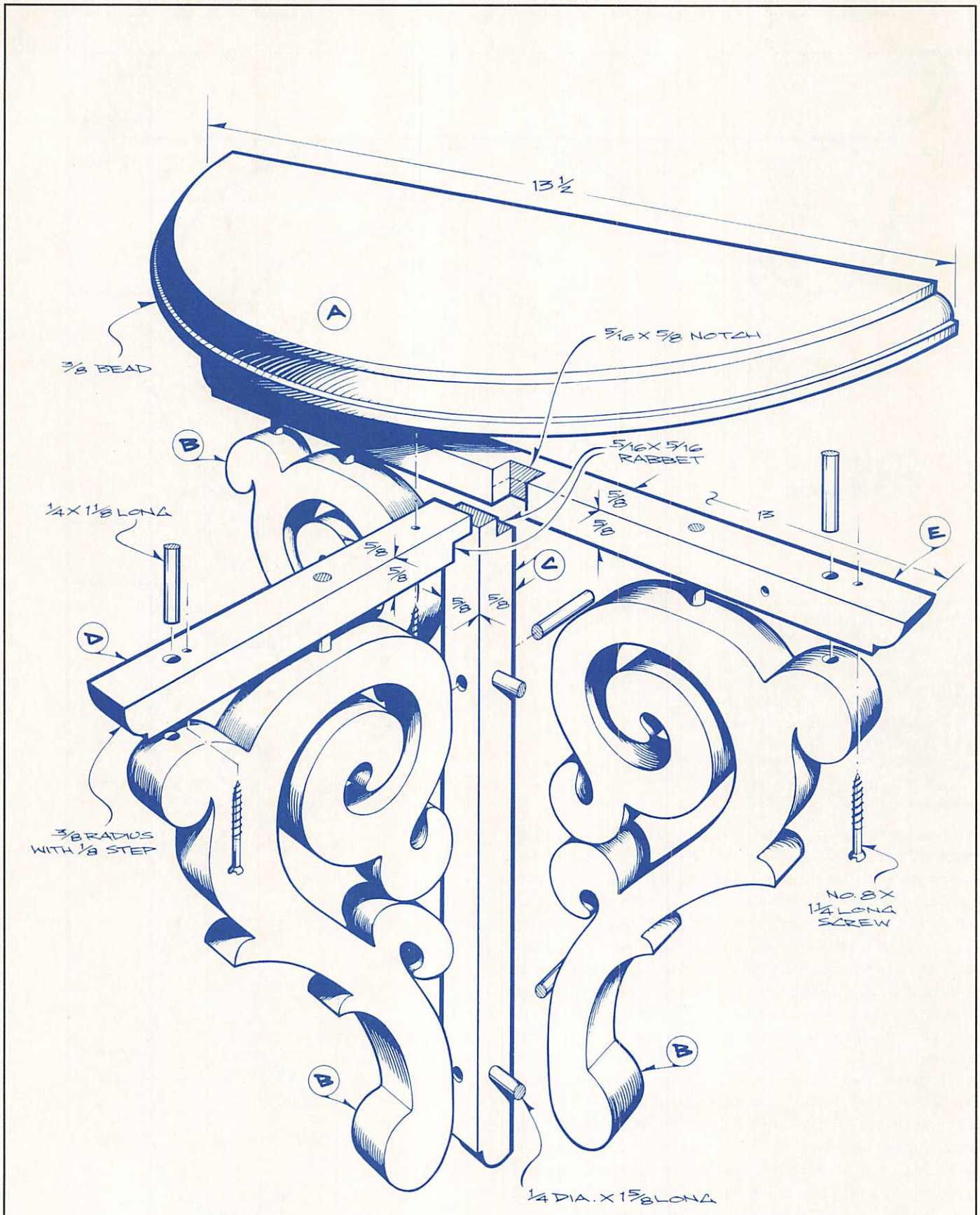
Part	Description	Size	No. Req'd.
A	Top	3/4 x 6 3/4 x 13 1/2	1
B	Scroll Bracket	see Full-Size Pattern	3
C	Center Cleat	5/8 x 5/8 x 9	1
D	Cross Cleat	5/8 x 5/8 x 6 3/16	1
E	Back Cleat	5/8 x 5/8 x 13	1

an interlocking half-lap joint where they meet. A 3/8 in. radius stepped roundover is cut on the cleat ends.

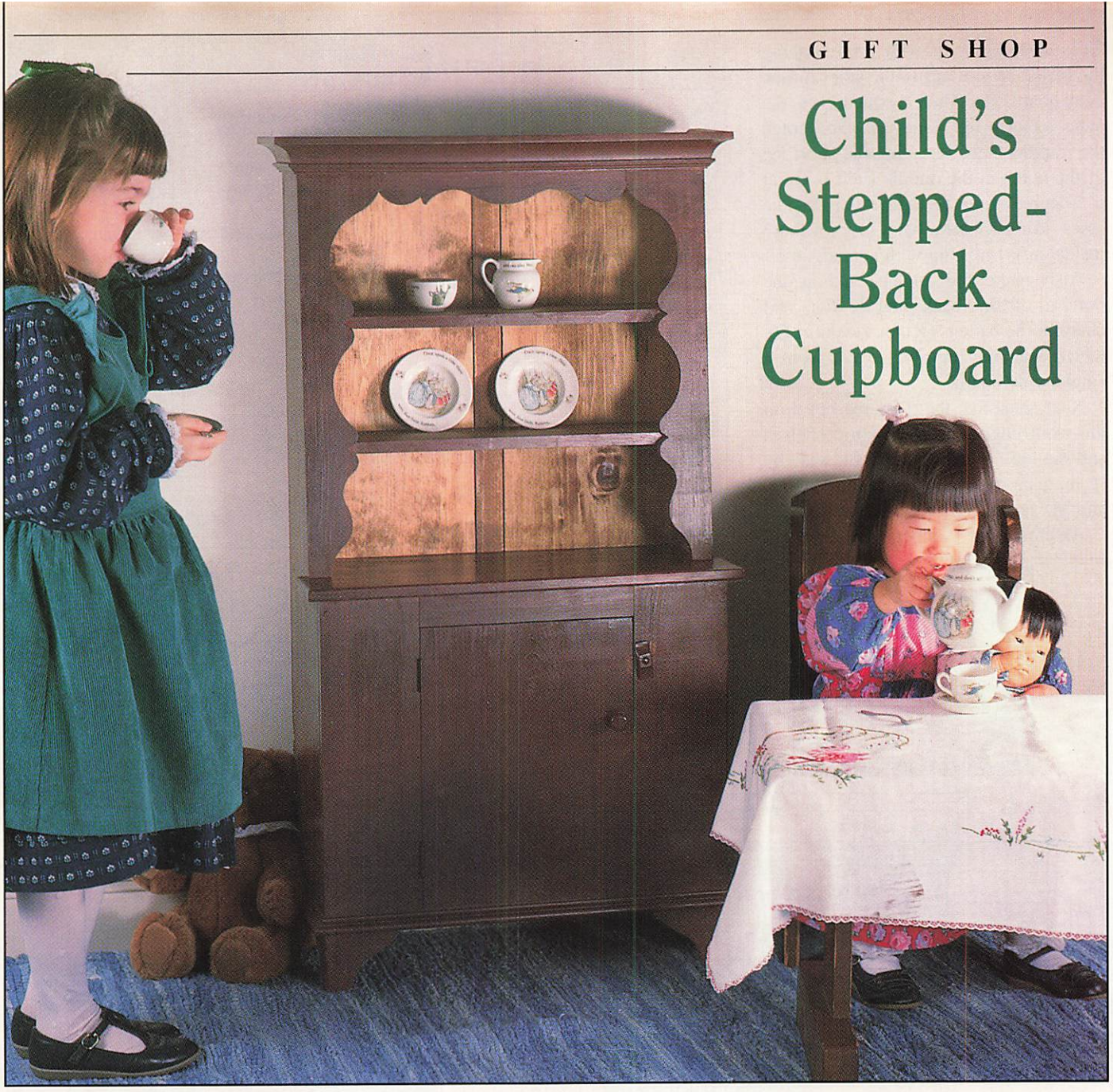
Assembly of the shelf is a little tricky. First, we used a number of small 1/4 in. diameter dowel pins to join the three scroll brackets to the center cleat. Then we glued and screwed the back cleat in position flush with the back edge of the shelf, and screwed the cross cleat in place. We then drilled for a series of 1/4 in. diameter dowel pins to join the bracket and center cleat assembly to the back and cross cleats. Pre-drilling through the cross cleat and back cleat into the brackets before the cleats are mounted to the shelf is one way to avoid dowel alignment problems. Or if you have a set of dowel center marking points, they are an easy way to get the alignment right.

If you plan to hang the shelf on a solid surface that you can screw directly into, then just drill two screw holes through the back cleat. For an invisible hanging method you can use keyhole hangers, mortised into the back of the shelf and back cleat. But if you are hanging the piece on a single stud, you'll need to locate two hangers on the center cleat, one over the other, to keep the shelf from tipping.

After final sanding, finish the shelf with several coats of tung oil or clear spray lacquer.


13 1/2
A
3/8 BEAD
5/16 X 5/8 NOTCH
B
5/16 X 5/16 RABBET
1/4 X 1 1/8 LONG
5/8
5/8
2
13
E
C
5/8
5/8
D
3/8 RADIUS WITH 1/8 STEP
NO. 8 X 1 1/4 LONG SCREW
B
B
1/4 DIA. X 1 5/8 LONG

Child's Stepped-Back Cupboard



Our resident craftsman Mark Ziobro made this small cupboard for his daughter Chelsea, 2, and gave it to her for Christmas. But he advises fathers and grandfathers that making more than one will insure family harmony. Cory, 6, wants one too.

The cupboard is a scaled-down version of a slant-top cupboard. To make a piece look right in a smaller version, the stock thickness must be reduced, so our cupboard employs 5/8 in. thick pine for most of the parts and 1/2 in. thick pine for the back.

Start by cutting all the parts to the sizes shown in the Bill of Materials. Note that the rail lengths given include the tenons. With the lumber cut to size, lay the parts for the scalloped front on the bench, arranged the same way they will be on the completed cupboard. Transfer the profiles from the grid pattern to the scalloped stiles (E) and the scalloped rail (F). Also transfer the profiles to the sides (A) and bottom stiles (B).

Before cutting out the profiles, establish the mortise and tenon joints on the scalloped rails, as well as the two bottom rails (C and D). Use a 1/4 in. diameter drill bit to rough out the 1/4 in. wide by 1/2 in. long by 1/2 in. deep mortises in the scalloped sides and the bottom stiles. Clean up the cuts with a chisel.

Next, use the table saw to establish the shoulders of the tenons as shown on the rail details. First raise the saw blade 3/16 in. high and use a stopblock and miter gauge to cut two sides of each rail. The side shoulders of all the rails are the same. But the top and bottom shoulders are different (see rail details), so you'll need to change the saw blade height for each of the three rails, while keeping the stopblock and miter gauge setup the same. Use a tenon jig on the table saw to cut the cheeks on the ends of the rails.

With the mortise and tenon joints formed, cut the rabbet and dadoes in the sides for the top (K), the top shelves (I and J), the middle shelf (G), and the lower shelves (H). The dadoes are 5/8 in. wide by 1/4 in. deep and are located as shown in the side elevation. Also cut the

1/4 in. deep by 1/2 in. wide rabbets along the inside back edges of the sides for the back boards (L). Then lay out and cut the sides to form the slant back, and notch the middle shelf. Note that the short leg of the notch in the middle shelf is cut at a 5-degree angle to fit the slant of the sides. You can use a band saw for these inside cuts, finishing with a handplane.

Also make the angled cuts at the bottom of the back boards (L), and chamfer the battens (R) for the door (Q), which you may be able to cut from a single wide board.

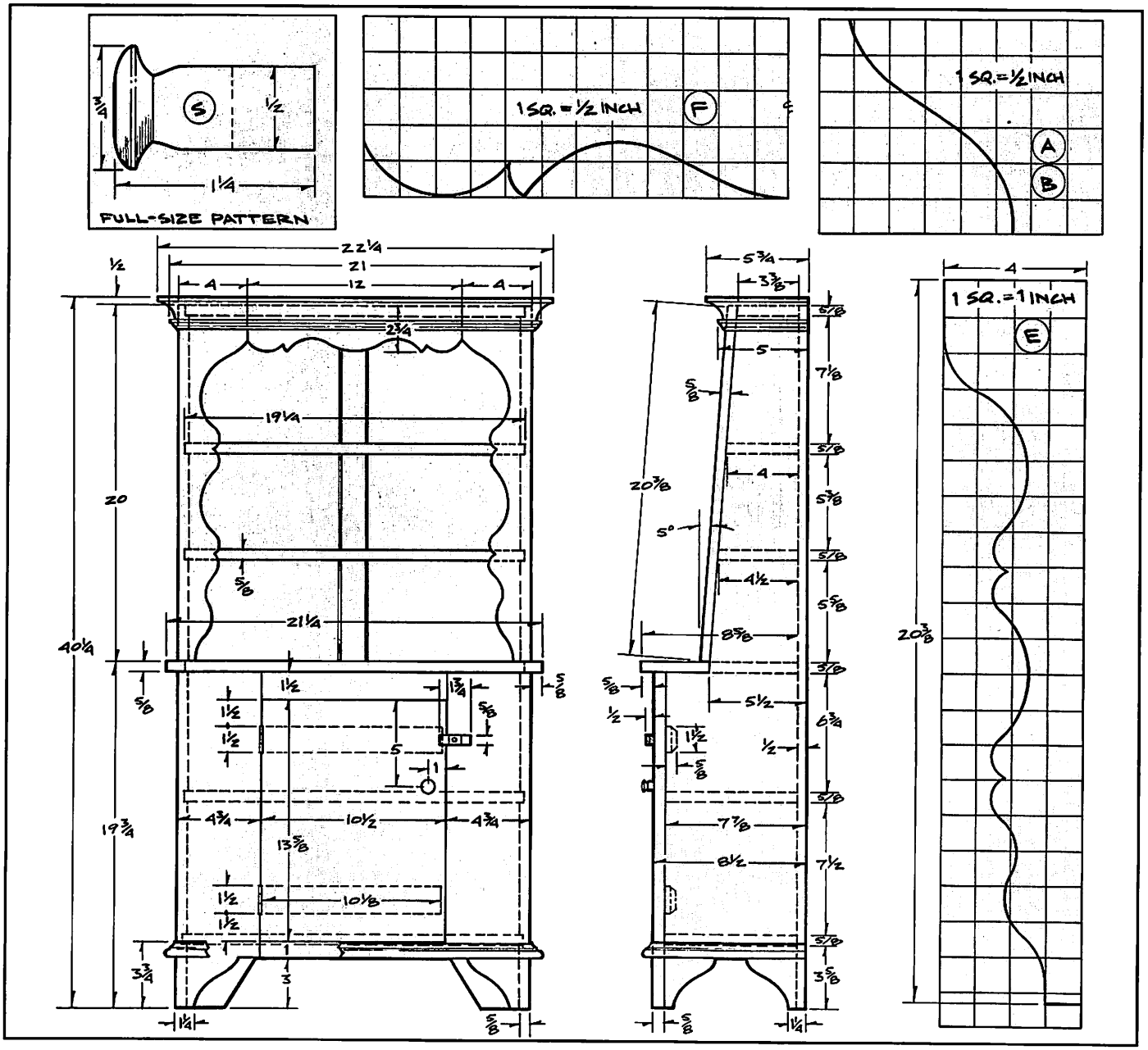
Next, establish the 5-degree bevel on the front edges of the two top shelves and the top. Then cut the 1/4 in. wide by 1/4 in. deep rabbets in the back boards (L and M) as shown in the back detail.

Assemble the cabinet with glue and

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Side	5/8 x 7 7/8 x 39 3/4	2
B	Bottom Stile	5/8 x 4 3/4 x 19 1/8	2
C	Bottom Rail (lower)	5/8 x 1 x 11 1/2*	1
D	Bottom Rail (upper)	5/8 x 1 1/2 x 11 1/2*	1
E	Scalloped Stile	5/8 x 4 x 20 3/8	2
F	Scalloped Rail	5/8 x 2 3/4 x 13*	1
G	Middle Shelf	5/8 x 8 5/8 x 21 1/4	1
H	Lower Shelf	5/8 x 7 3/8 x 19 1/4	2
I	Top Shelf (upper)	5/8 x 4 x 19 1/4	1
J	Top Shelf (lower)	5/8 x 4 1/2 x 19 1/4	1
K	Top	5/8 x 3 3/8 x 19 1/4**	1
L	Back (side)	1/2 x 8 3/4 x 39 3/4	2
M	Back (middle)	1/2 x 2 x 36 3/4	1
N	Lower Molding	as shown***	as req'd
O	Top Cove Molding	1 in. radius cove	as req'd
P	Top Ogee Molding	as shown***	as req'd
Q	Door	5/8 x 10 1/2 x 13 5/8	1
R	Batten	5/8 x 1 1/2 x 10 1/8	2
S	Knob	as shown	1
T	Hinge	1 1/2 x 1 1/2 butt	2
U	Turnbutton	1/2 x 5/8 x 1 3/4	1

* Length includes tenon
** Actual width at point of 5-degree bevel on front edge will be more.
*** Available from MLCS Ltd., P.O. Box 4053, Rydal, PA 19046; 1-800-533-9298. Order catalog no. 491 for the classical bit ($25) and order catalog no. 360 for the ogee bit ($18). Prices include postage.



sixpenny nails. The cut nails are available from the Tremont Nail Co., P.O. Box 111, Wareham, MA 02571; (508) 295-0038. The battens are nailed onto the back of the door with threepenny cut nails.

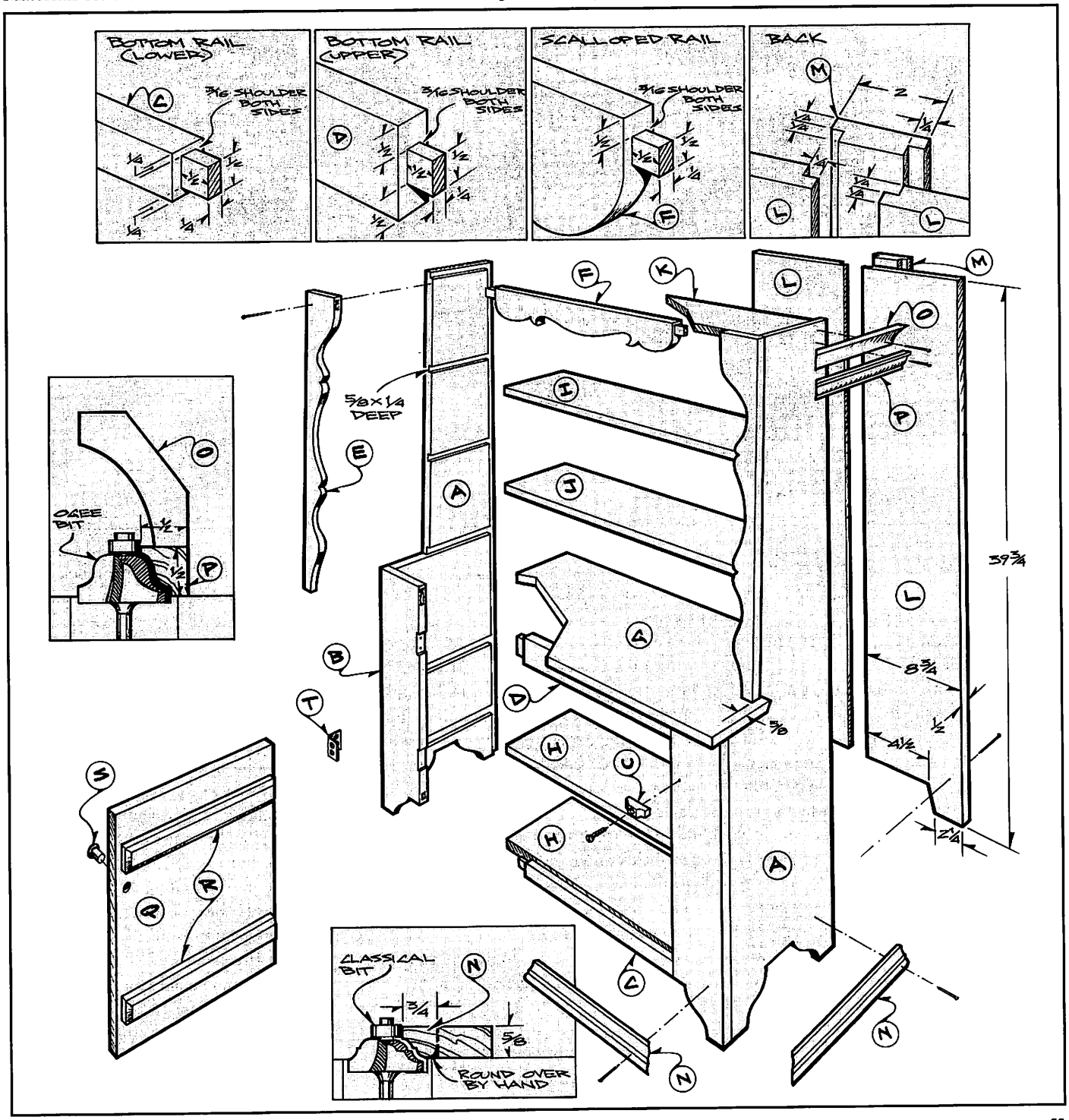
The 1 in. radius top cove molding (O) is available at lumberyards. The top ogee molding (P) is cut with a 5/32 in. radius ogee router bit. The lower molding (N) is cut with a classical router bit. To get the bullnose, you can hand shape with a file and sandpaper. See the Bill of Materials for a source for the router bits. You can substitute similar moldings made with cutters you have on hand.

When you use the router bits to make the moldings, work with pieces wide and long enough to handle comfortably. It's much safer to rip the molded edge off a wide board than it is to work with narrow stock. Miter the moldings and apply them to the cupboard with threepenny finishing nails. Note that the 5-degree slant, in theory, would alter the way the top molding pieces lie, and require thin wedges along the top. However, the angle is so slight here that it's not noticeable.

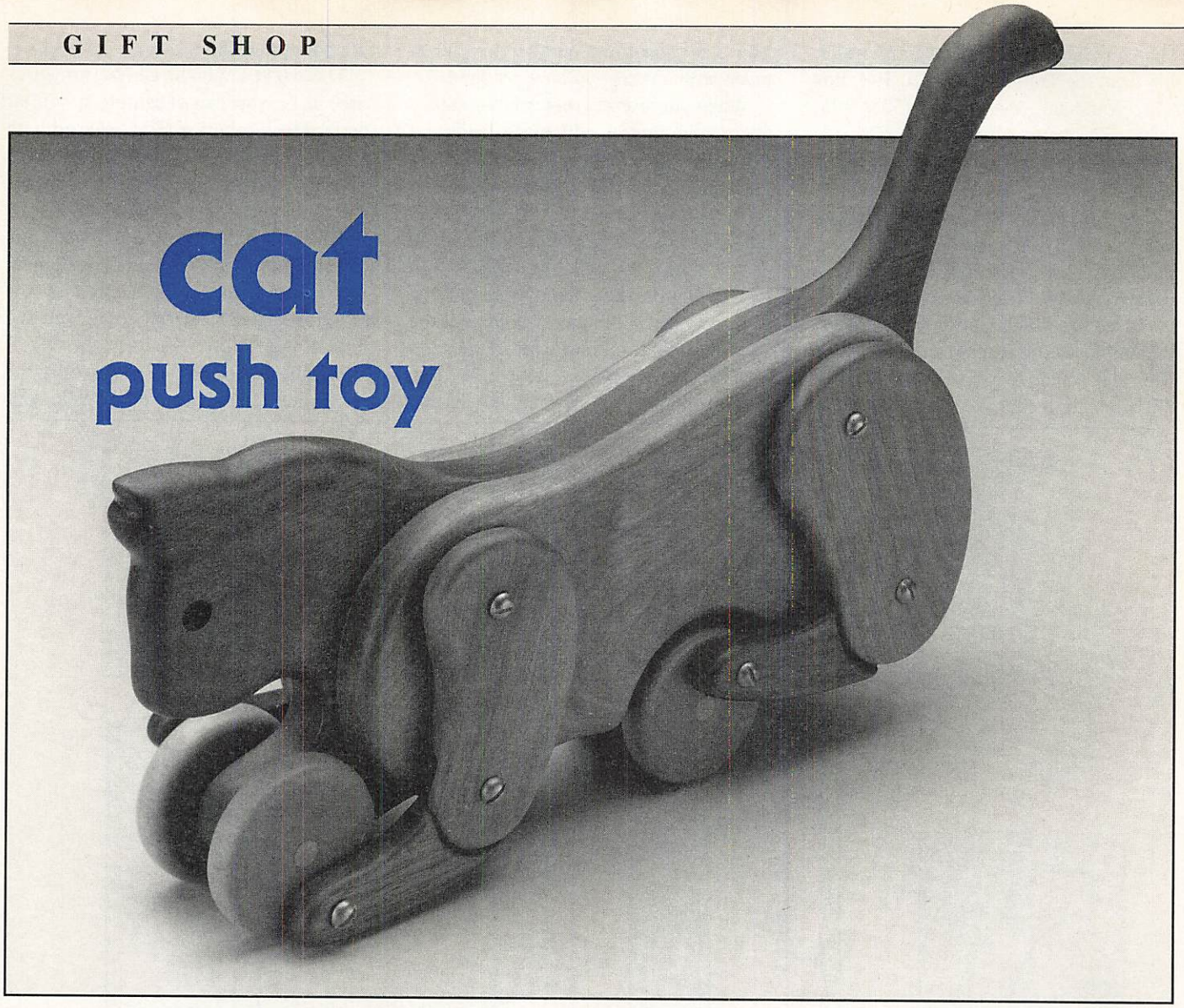
The wood knob (S) can be turned as shown, or you can substitute a similar knob. The turnbutton (U) is shaped with files. The hinges (T) are standard butt hinges, which are mortised into the stiles and the door.

For a finishing touch, use a wood file to round over the edges of the middle shelf, and chamfer the insides of the scalloped stiles and rail to lighten the look of the front.

Finish the piece with stain on the inside and red paint on the outside.



cat push toy



This cat is a pet that's sure to please. No food, litter, hair, fleas, mess or meow.

We call the cat a toy, but it also makes a great mobile sculpture for your coffee table. You'll have to build the cat to see for yourself, but its motion is truly captivating. As the cat is pushed along by its convenient tail/handle, the wheels create a surprisingly catlike leg action. Depending on how the wheels are arranged at assembly, the cat can have either a creeping or a pouncing motion. Our thanks to Schenectady, New York toy builder Skip Arthur for the design.

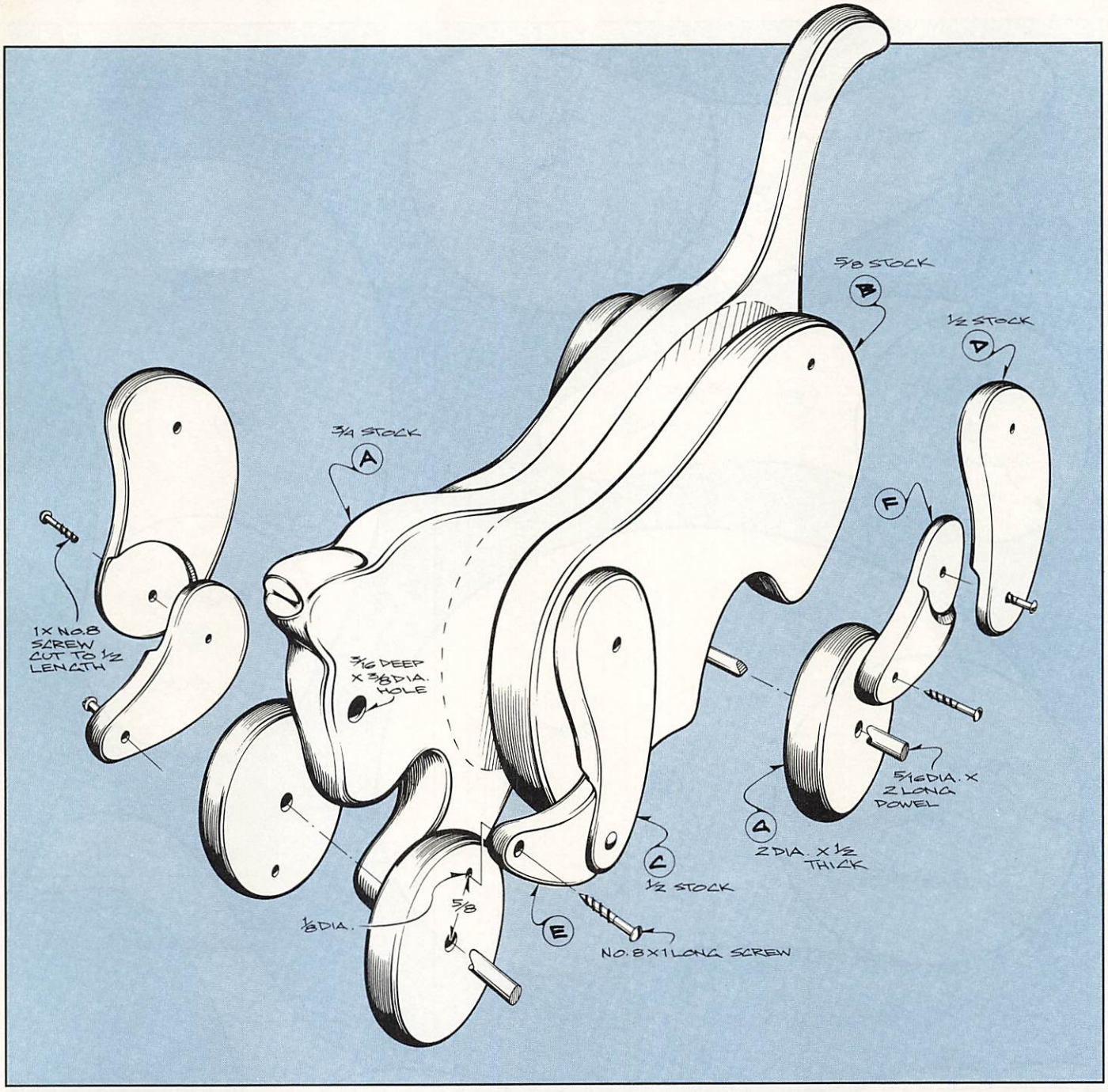
The cat shown is built of birch and walnut. The color contrast works well and adds to the lifelike look. You will need 3/4 in. thick walnut for the body center (A), 5/8 in. thick birch for the body sides (B), 1/2 in. thick birch for the upper legs (C, D) and wheels (G), and 1/2 in. thick walnut for the lower legs (E, F). We've provided full-size patterns for the legs, and a grid pattern for the body sections.

The body center and sides are cut out with a band saw or jigsaw. Drill the eye holes and axle holes in the locations shown, but enlarge the axle holes a little to allow the axles freedom to turn. Glue on the two sides, smooth the profile along the back and bottom where the center and sides align, and then round the edges of both sides. A 1/4 in. radius ball-bearing guided roundover bit comes in handy for the edge-rounding on the sides. Use files and sandpaper to shape the head and tail.

The leg sections employ a rounded half-lap joint at the knee. The joint isn't difficult to make, but it's important since it gives the legs their remarkably natural movement. You'll need either multispur or Forstner bits to cut the joints. A 1 1/2 in. diameter bit is needed for the front leg joint and a 2 in. diameter bit is needed for the back leg joint. Multispur bits are the best choice because they produce the smoothest cut.

The best way to make the leg sections is to lay them out on 1/2 in. thick stock, cut the half-lap joints with the multispur or Forstner bits in the drill press, and then cut out the leg section profiles with the band saw or jigsaw. But don't make two identical upper and two identical lower leg sections for each pair of legs. The left and right side leg sections use the same profile, but the half-lap cuts are on opposite sides. An easy way to get everything right is to lay out two of each part, but flip each duplicate pattern. That way you can make all your half-lap joint cuts on the same face of each board. Use the depth stop on the drill press to limit the depth of cut to 1/4 in.

Cut the leg sections out and round the edges as shown. A 3/16 in. radius



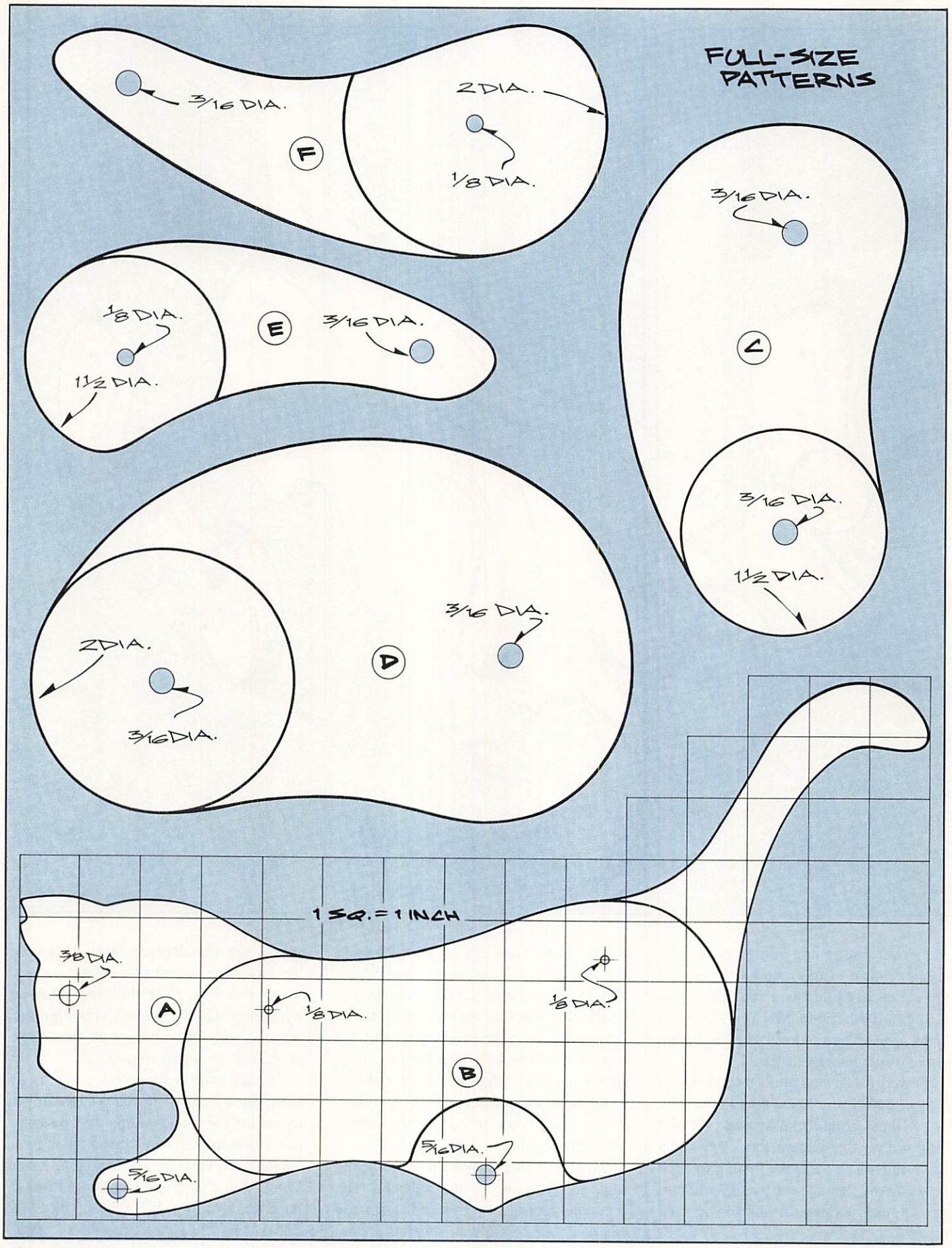
roundover bit in the router table will simplify most of the roundover work on the leg sections, but you can also round the edges with sandpaper. You'll need to hand sand the roundover on the inside curve of the half-lap joints.

Now drill the assembly screw holes. The assembly screws are all 1 in. long by no. 8 brass roundhead screws, but the four screws that secure the knee joints are cut to a 1/2 in. length. Small parts can be a choking hazard for young children, so we used epoxy to anchor all the screws.

The wheels are just 1/2 in. thick by 2 in. diameter disks with rounded edges. Lay out the wheels with a compass, cut just outside the line with the band saw or jigsaw, then use the disk sander to final sand to the line. A jig made from a scrap of 3/4 in. thick plywood, with a dowel mounted in the plywood as a pivot point, is a handy way to sand the wheels perfectly round.

There are several ways to arrange the legs in relation to the wheels. The creeping motion is produced when the opposing wheels are positioned so the screws are 180 degrees apart. This way the lower leg sections—or paws—seem to advance one after the other, just as with a cat stalking prey. If you align the wheels with the screws at the same point, the cat seems to pounce.

The best finish for wooden toys is to leave them natural. If you want a finish to accent the wood grain, try Preserve. It's a non-toxic nut oil that's safe, even when wet. Preserve is available from Woodcraft, 210 Wood County Industrial Park, Parkersburg, WV 26102; tel. 800-225-1153.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3/16 DIA.
F
2 DIA.
1/8 DIA.
1/8 DIA.
1½ DIA.
E
3/16 DIA.
3/16 DIA.
C
3/16 DIA.
1½ DIA.
2 DIA.
3/16 DIA.
D
3/16 DIA.
1 SQ. = 1 INCH
3/8 DIA.
A
1/8 DIA.
1/8 DIA.
B
5/16 DIA.
5/16 DIA.

Tabletop Armoire

This Tabletop Armoire is an elegant piece with classic proportions. It's perfect for use as a curio cabinet or perhaps a dresser-top jewelry chest. Our armoire is made of pine, but consider using a hardwood if you don't like the painted look.

Start with the top (A). As shown in the Top Detail, the top is built up of two boards to get the needed $1\frac{3}{4}$ in. thickness. Glue both boards together and when dry, rip the top in half along the dotted line. You can skip this ripping step if you have a bandsaw with a $6\frac{3}{4}$ in. or greater resaw capacity. If you plan on ripping the top in half before cutting the profile, add an extra $\frac{1}{8}$ in. to the width of the stock to account for the material lost when the ripping cut is made.

Next, lay out the $5\frac{1}{2}$ in. and $6\frac{1}{4}$ in. radii on the edge of the top, as shown in the elevation. You'll need to do the layout on both of the pieces if you ripped the top in half. Cut the profile, then glue the two halves of the top back together, being careful to keep them in register. Use files and sandpaper to fair any unevenness and smooth away the bandsaw marks. But don't round the edges or cut the stopped dadoes for the side panel assemblies yet. You'll do that later, before you fit the top to the case.

The case is a frame-and-panel assem-

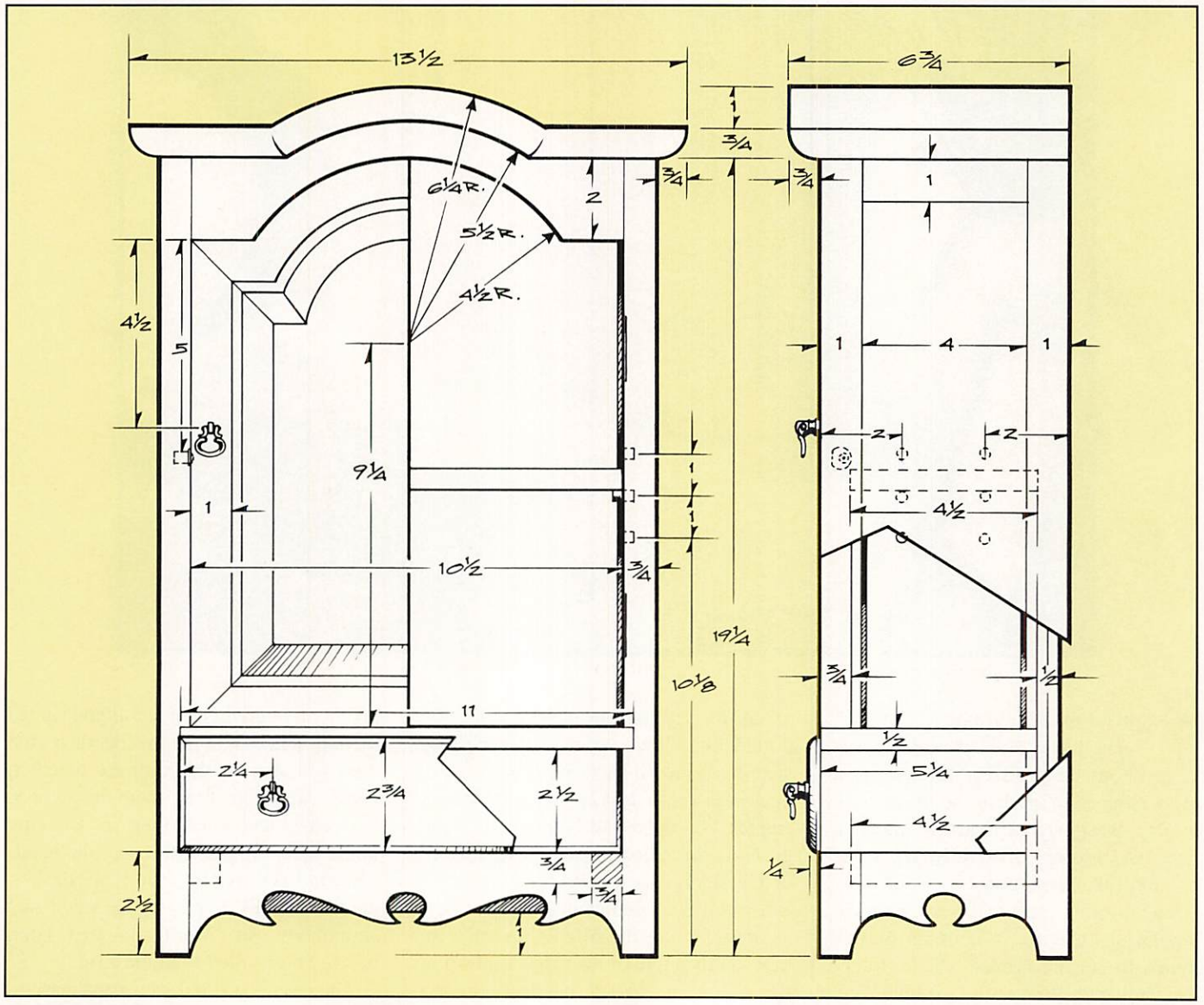
bly. Start by constructing the side frames. They consist of stiles (B) joined by a top rail (C) and bottom rail (D). The stiles are identical except that the front stiles have a 1/4 in. wide by 1/4 in. deep groove cut full-length on one edge, while the back stiles have this groove both on an edge and on a side (see Corner Detail). The 1/4 in. by 3/8 in. tongue on the top end of the side frame-and-panel, the profile on the lower end, the stopped dado for the shelf, and the grooves for the top and bottom front stretchers are all cut after the side frame-and-panels have been assembled.

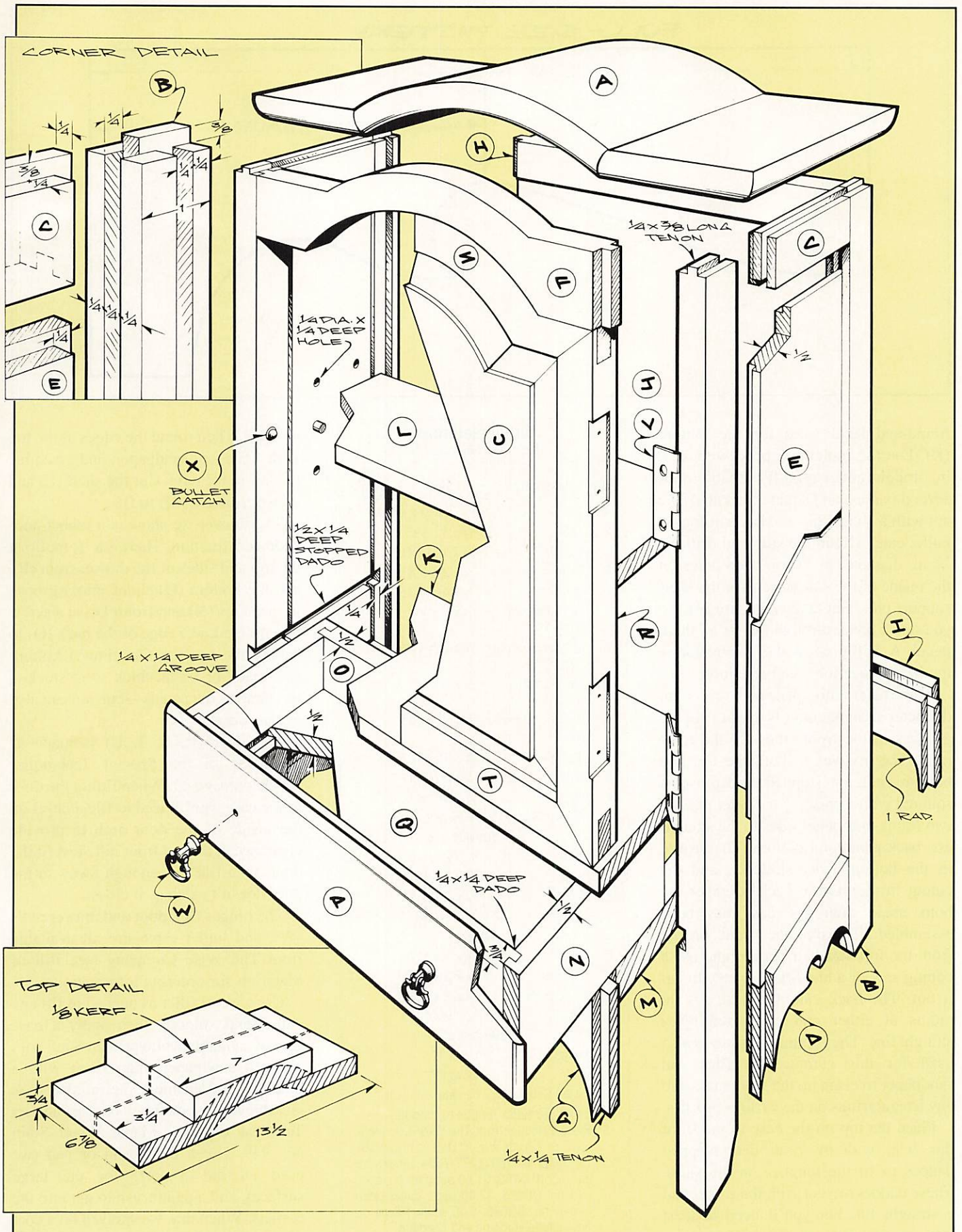
Before starting any assemblies, cut the remaining case parts. Note that the side panels (E) and back panel (J) are both cut for an exact fit top to bottom, but allow a little room for wood movement side to side. We made our panels from solid stock, but if you use plywood instead, there's no need to allow extra room for wood movement. The panels are cut to size, and then a 1/4 in. by 1/4 in. rabbet is cut all around. If you make the panels from solid stock, and plan to paint the armoire, make the rabbet a little deeper so that the thickness of the tongue is about 1/32 in. less than the groove width. The tongue on the panels must be a little thinner than the groove so the paint won't peel off during assembly. We painted the panels first since if they're painted after assembly and there's some shrinkage, then an unsightly line would show.

Also cut the front stretchers (F, G) and back stretchers (H, I). Note that the back stretchers are both grooved to accept the back panel, and that the top stretchers both front and back must also be shaped to fit the top. But don't worry if you can't get a perfect fit. Any gaps between the top stretchers and the top will be filled and sanded before you paint.

Assemble the frame-and-panel sides. When dry, cut the profile on the bottom (see full-size half-pattern), and establish the 1/4 in. by 3/8 in. tongue on the top. Note that when you cut the bottom profile, you'll actually be cutting 1/4 in. deep into the stile. Be careful not to lose any of the short grain sections of the bottom rail. If any do break off, glue them back. At the final preparation stage prior to painting, you can sand any inconsistencies or fill any gaps.

Now cut the stopped dadoes in the




CORNER DETAIL
B
C
E
1/4
3/8
1
A
H
F
S
L
U
X
BULLET CATCH
1/4 DIA. X 1/4 DEEP HOLE
1/4 X 3/8 LONG TENON
J
V
E
1/2
K
1/2 X 1/4 DEEP STOPPED DADO
R
I
1/4 X 1/4 DEEP GROOVE
O
T
1 RAD.
Q
W
A
1/4 X 1/4 DEEP DADO
N
M
B
D
G
1/4 X 1/4 TENON
TOP DETAIL
1/8 KERF
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3/4
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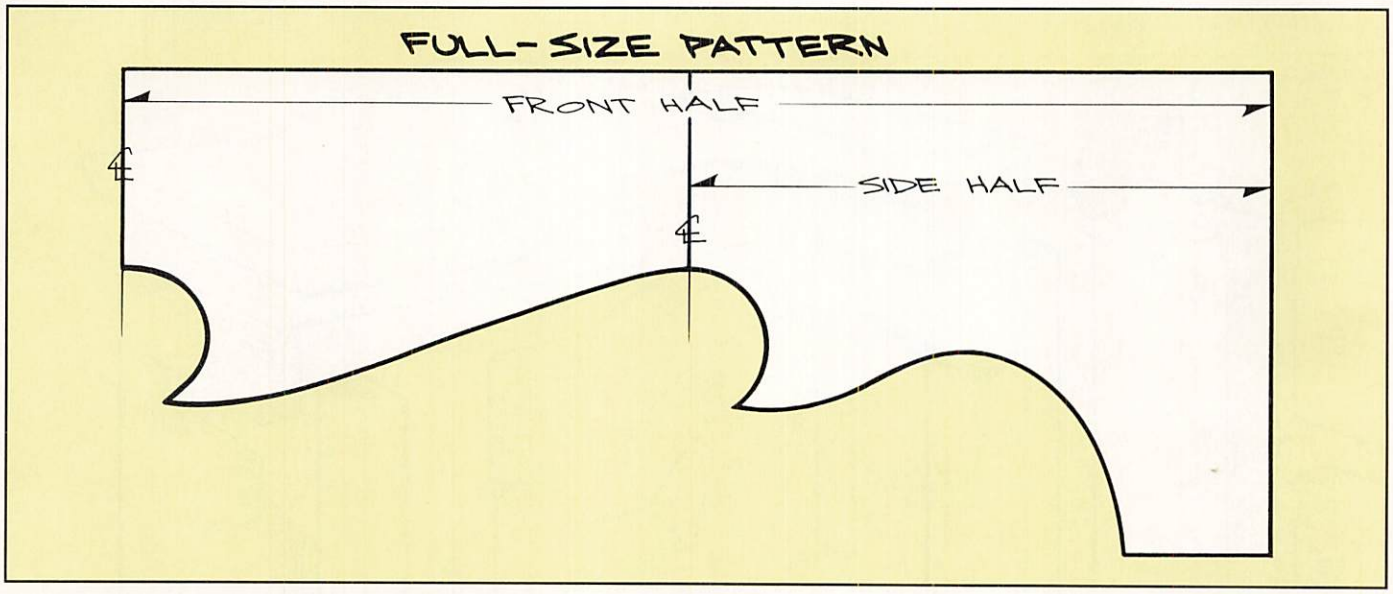
6 7/8
13 1/2



frame-and-panel sides for the bottom (K). Use the router equipped with a 1/2 in. straight cutter (you'll probably need several passes) and square the end of the cut with a 1/4 in. chisel. Also drill for the bullet catch (X) in the stile and drill the 1/4 in. diameter by 1/4 in. deep holes on the inside of the side panels for the shelf support pins. But take great care here so you don't break through the 1/2 in. thick panel. A drill press with a depth stop is the best choice for both these jobs.

The router equipped with a 1/4 in. diameter straight cutter is used to cut the grooves in the front stiles for the front rails. The grooves at both the top and bottom ends are stopped, and must be squared with a chisel. Now assemble the two frame-and-panel sides to the stretchers, back panel and bottom. The profile in the bottom front stretcher, and the cutout in the bottom back stretcher are both made after the case has been assembled. Transfer the front profile from the full-size half-pattern and use a coping saw or a hand-held jigsaw to cut it out. The back cutout is just a 1 in. radius at either end connected by a straight line. The coping or jigsaw is also used for this cutout. Use files and sandpaper to clean up the saw marks and any irregularities on the various profiles.

Place the top on the case to mark for the 1/4 in. wide by 3/8 in. deep stopped dadoes to fit the tongues on the sides. These dadoes are cut with the router and a straight bit, but you'll need at least three passes, each removing about 1/8 in.

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Top	1 3/4 x 6 3/4 x 13 1/2	1
B	Stile	3/4 x 1 x 19 5/8*	4
C	Top Rail	3/4 x 1 3/8 x 4 1/2*	2
D	Bottom Rail	3/4 x 2 1/2 x 4 1/2*	2
E	Side Panel	1/2 x 4 3/8 x 16 1/4	2
F	Top Stretcher (Front)	3/4 x 3 x 11*	1
G	Bottom Stretcher (Front)	3/4 x 2 1/2 x 11*	1
H	Top Stretcher (Back)	3/4 x 3 x 11*	1
I	Bottom Stretcher (Back)	3/4 x 2 1/2 x 11*	1
J	Back Panel	1/2 x 10 7/8 x 15 1/4	1
K	Bottom	1/2 x 5 1/4 x 11	1
L	Shelf	1/2 x 4 1/2 x 10 1/2	1
M	Drawer Runner	3/4 x 3/4 x 4 1/2	2
	Drawer		
N	Side	1/2 x 2 1/2 x 5 1/4	2
O	Back	1/2 x 2 x 10	1
P	Front	3/4 x 2 3/4 x 11	1
Q	Bottom	1/2 x 5 x 10	1
	Door		
R	Stile	3/4 x 1 x 11 3/4	2
S	Top Rail	3/4 x 3 x 10 1/2*	1
T	Bottom Rail	3/4 x 1 x 10 1/2*	1
U	Panel	3/4 x 9 x 12 1/4	1
	Hardware		
V	Hinge	1 1/2 x 1**	2
W	Pull	5/8 wide**	3
X	Bullet Catch	3/8 long x 5/16 dia.**	1

* Length includes tongue or tenon(s)

** Parts available from The Wise Company, 6503 St. Claude Ave., P.O. Box 118, Arabi, LA 70032; tel. (504) 277-7551. Hinges are part no. BH6150, $1.60 per pair; pulls are part no. DP38B, $2.40 each; bullet catch is part no. BH686, $.50 each. Prices do not include shipping and handling.

of stock. Then round the edges of the top with a file and sandpaper, and assemble the top to the case. Cut the shelf (L) and drawer runners (M) to fit.

The drawer we show is a rabbet-and-dado construction. There's a 1/4 in. lip at the top and sides of the drawer front (P), and the bottom (Q) slides into a groove in the sides (N) and front. Drive a screw up into the lower edge of the back (O) to anchor the bottom. Our drawer bottom was made of 1/2 in. thick solid stock—the same as the panels—but you can also use plywood.

The door (R, S, T, U) is made as described in the Special Techniques article on page 23. When fitting the door to the case, you'll need to file a bevel on the inside of the door arch to provide clearance at the top front rail. Test fit the door, then file just enough away so the door doesn't catch as it closes.

The hinges (V), door and drawer pulls (W), and bullet catch are all available from The Wise Company (see Bill of Materials for ordering information).

Use a wood filler as needed to fill any gaps, sand smooth, then apply a base coat of sandable white primer. Sand with 320-grit sandpaper, then paint with a pink or coral enamel. The mottled look is achieved by dabbing on McCloskey Tungseal Colonial Maple Wood Stain No. 949. Use a cloth wad or pad (we used an old T-shirt) for the large surfaces, and a paintbrush to get into the corners. When dry, we sprayed on a coat of clear lacquer to seal the finish. WWJ

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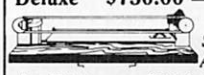

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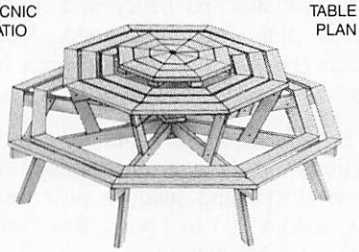

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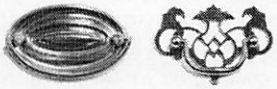

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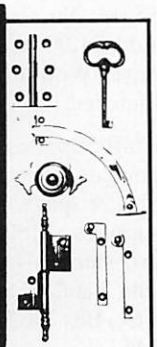

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Country Vegetable Bin, Folding Deck Chair, Shaker Pedestal Table, Wall Hung Display Cabinets, Wooden Coat Hanger, Toy Car and Trailer, Paper Towel Holder, Carved Hand-Mirror, Writing Desk, Carved Walking Stick, Laminated Clock, Oak and Glass End Table, *Articles:* Lay Out and Make Circular Cuts; Mail Order Selling; Stripping Old Finishes; Carving the Ball-and-Claw Foot.

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Wag-on-Wall Clock, Oak Swing, Candy Dispenser, Coffee and End Tables, Tugboat and Barge, Lazy Susan, Early American Mirror, Colonial Pipe Box, Sewing Machine Cabinet, Cam Clamp, Hamper, *Articles:* What Sells Best?; Homemade Removers; Buying a Basic Set of Hand Tools; Kerf Bending; Caning and Wood Finishing Suppliers.

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Vol. 8 No. 6 Nov-Dec '84

Stickley Chair, Tool Cabinet, Shaker Sewing Stand, Lighted Display Pedestal, Teardrop Clock, Pierced Tin Cabinet, Toy Hook and Ladder Fire Truck, Busy Bee Toy, Colonial Doll House, Kitchen Organizer, Wine Server, Grandfather Clock: Part II (Part I available by request), *Articles:* Starting a Business: Part II; Applying the Final Finish; The Fundamentals of Wood; Inlays and Inserts; Gustav Stickley and American Mission Furniture.

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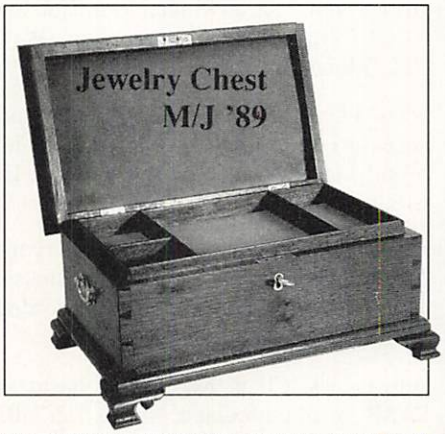

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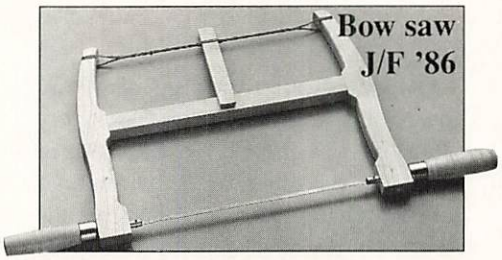

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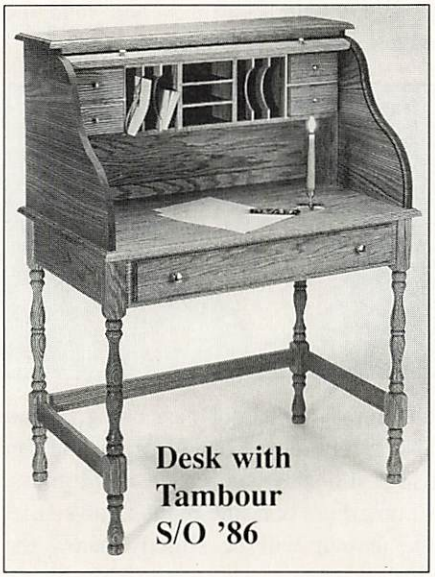

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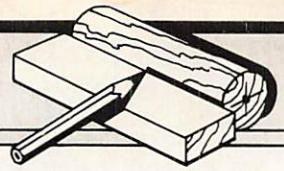
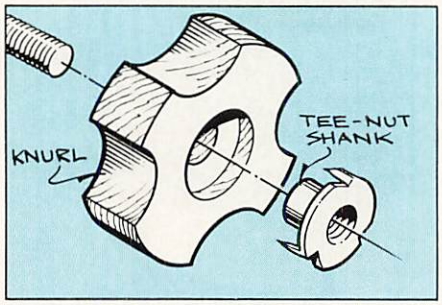


Shop Tips

Woodworking jigs and fixtures often make use of threaded knobs. Some mail-order companies sell plastic ones, but you can make a wooden version that will work just as well—and the cost will be minimal. To make one, cut the knob to size on the band saw and sand the edges smooth. The four "knurls,"



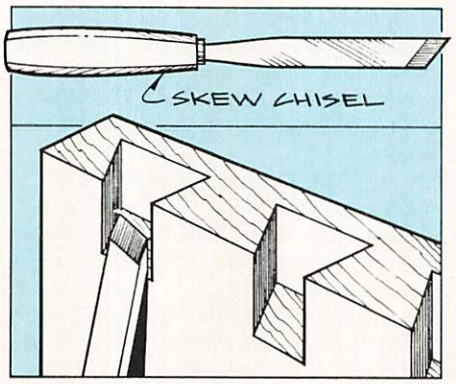
which make the knob easier to grip, can also be cut on the band saw, or you can use a Forstner bit in the drill press. Counterbore one side of the knob so that the tee-nut will be slightly below the surface when it is inserted. Also, bore a hole through the knob to accept the shank of the tee-nut. Tee-nuts are sold at most hardware stores.

Ralph E. Dreisbach, Fenton, Mich.

An old toothbrush makes a good file brush if the bristles are trimmed so they are about 1/8 in. long. The short bristles are quite stiff, so they do a nice job removing sawdust from between the file teeth.

Howard E. Moody, Upper Jay, N.Y.

When cutting blind dovetails, it can be difficult to get a cabinetmaker's chisel into the tight corners. I've found



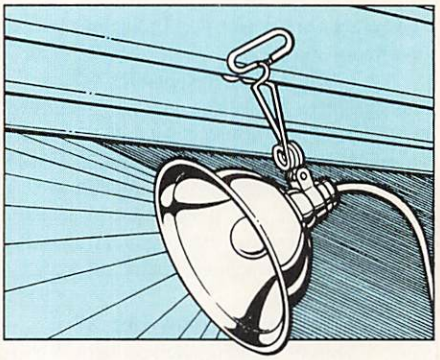
that a carver's skew chisel is helpful here. The blade is pointed, and both sides are beveled, so it gets into almost any tight spot with little trouble.

Gerald R. Randolf, Danbury, Wis.

Many hardware stores sell steel "antique" hinges, but they don't look very authentic. For more of a hand-forged look, heat the hinge for a few minutes with a propane torch, then hammer the leaves on an anvil with a ball peen hammer. The heat softens the steel a bit, making it a little easier to work. The heat also imparts a color much like hand-forged steel.

You'll need to hammer the steel for about 10 minutes. First, flatten the leaves with the square end of the hammerhead. This will make the edges somewhat uneven, but that's the way the old hinges looked. Then you can use the round end of the hammerhead to add a few distress marks. Avoid hitting the barrel of the hinge; if you do, it's not likely to work. Since some bits of metal may fly, be sure to wear safety glasses before you start.

A clip-on lamp makes an excellent portable light source for the workshop. The spring clip will open to about 2 in. wide, so it clamps to almost anything. And once it's clamped in place, a swivel



joint allows the lamp to be adjusted to various positions. Clip-on lamps sell for around $10 at most camera shops. Some hardware stores also carry them.

The Woodworker's Journal *pays $25 for reader-submitted shop tips that are published. Send your ideas (including sketch if necessary) to:* ***The Woodworker's Journal,*** *P.O. Box 1629, New Milford, CT 06776, Attention: Shop Tip Editor. We redraw all sketches, so they need only be clear and complete. If you would like the material returned, please include a self-addressed stamped envelope.*

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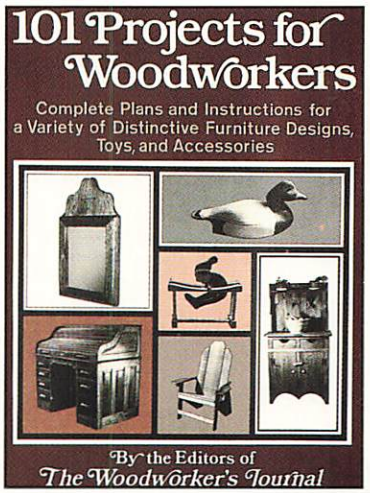
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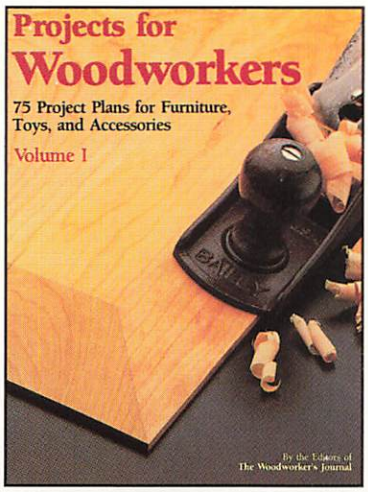
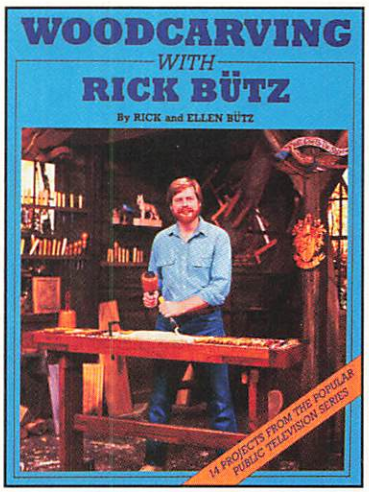
By the Editors of The Woodworker's Journal

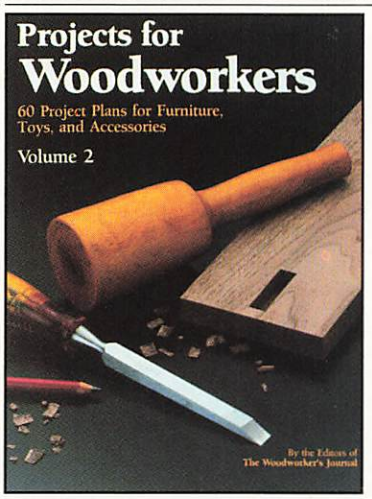
101 Projects For Woodworkers
For the eager amateur just starting out or the craftsman with a shop full of tools, **101 Projects For Woodworkers** features an unparalleled variety of classic projects for everyone. Included in this collection of plans from the 1977-80 issues of *The Woodworker's Journal* magazine are a classic Rolltop Desk, an old-fashioned Porch Swing, traditional and contemporary furniture, clocks, mirrors, home accessories, toys and novelties. Complete instructions and illustrations.


Projects for Woodworkers
75 Project Plans for Furniture, Toys, and Accessories
Volume 1
By the Editors of The Woodworker's Journal

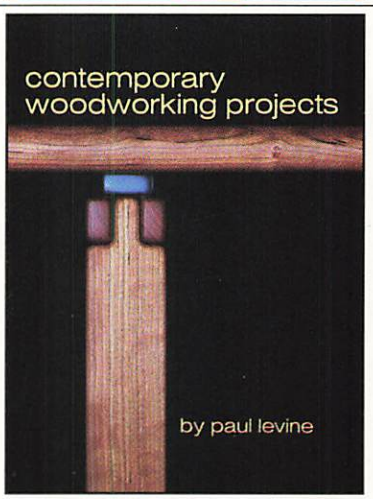
Projects For Woodworkers, Volume 1
Beginning and advanced woodworkers alike will appreciate the full range of styles in furniture, accessories, lamps, clocks, toys and gifts. Of the 75 projects selected from the 1980-81 issues of *The Woodworker's Journal* magazine, plans include a Cabinetmaker's Workbench, Pine Shaker Cupboard, Old-time Icebox, a Cobbler's Bench Coffee Table and a Child's Victorian Sled. Fully detailed instructions, illustrations, and photos.



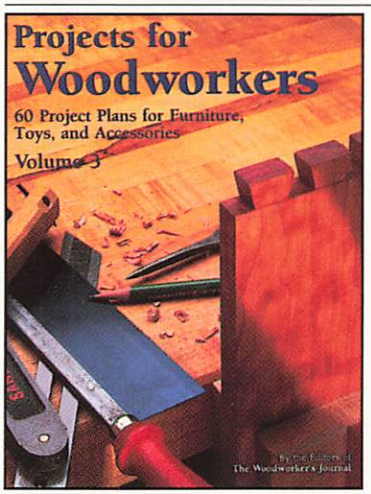
Woodcarving With Rick Butz
Learn woodcarving! With just a few tools and a few hours to spare, you can share in the simple pleasures of carving.Wander into the Black Forest of Germany with a traditional carving of St. Nick, or into a small Russian village with a Dancing Bears folk toy. You'll enjoy a chip-carved Quilt Rack, wildlife carvings, and a Tobacconist's Indian. All 14 projects are fully detailed with step-by-step photos. There are also chapters on tool selection, sharpening, whittling, chip and relief carving.


Projects for Woodworkers
60 Project Plans for Furniture, Toys, and Accessories
Volume 2
By the Editors of The Woodworker's Journal

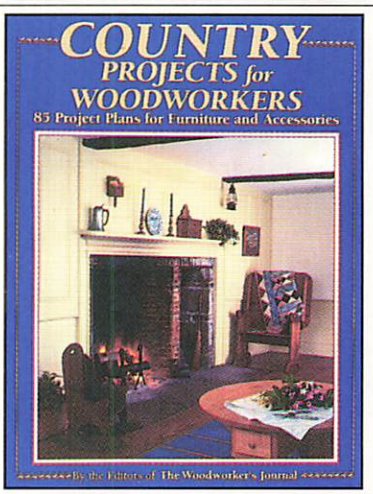
Projects For Woodworkers, Volume 2
Originally published in the 1982 issues of *The Woodworker's Journal* magazine, all 60 projects were chosen with a wide variety of styles and skill levels in mind. Each project is presented with complete instructions and thorough illustrations. You'll find household accessories like the Desk Caddy, Casserole Dish Holder, and Breakfast Tray easy to build. And you're sure to enjoy the reward of completing more involved projects like the Tambour Desk, Old Danish Chest of Drawers and Swinging Cradle.



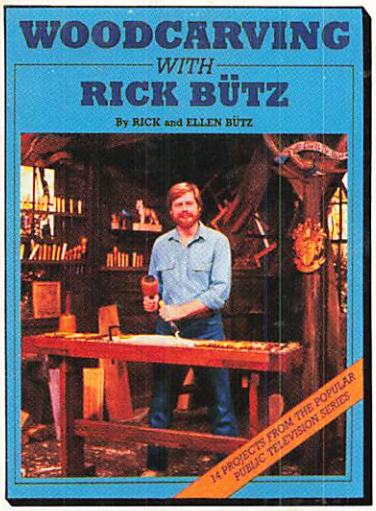
Contemporary Woodworking Projects
Paul Levine guides woodworkers of all skill levels through room-by-room chapters of coordinated furniture and accessories. The clean angles, sturdy joinery and special techniques are made easy to master with step-by-step instructions and illustrations. Among the 40 handsome projects are a matching Love Seat, Chair and Ottoman set, an Oak Credenza, a Platform Bed, and a Japanese Shoji Lamp. Children will enjoy their own table and chair set, puzzles and a great box of dominoes.


Projects for Woodworkers
60 Project Plans for Furniture, Toys, and Accessories
Volume 3
By the Editors of The Woodworker's Journal

Projects For Woodworkers, Volume 3
The best projects from the 1983 issues of *The Woodworker's Journal* magazine—toys, lamps cupboards, chests, cabinets, tables, planters, mirrors, and much more. Clear illustrations and thorough written instructions make each project easy-to-understand and fun to build. A book you'll want to keep within easy reach of your workbench.



Country Projects For Woodworkers
If building the simple, sturdy furniture of the old cabinetmakers appeals to you, then you'll want this collection of the best country projects from the 1980-84 issues of *The Woodworker's Journal* magazine. 85 complete plans range from weekend projects like Colonial Candlesticks and Fireplace Bellows to more challenging projects such as a Shaker Chest of Drawers, a Stepped-Back Hutch, and an 18th Century Trestle Table. Some plans are also found in *Projects for Woodworkers,* Volumes 1, 2 and 3.



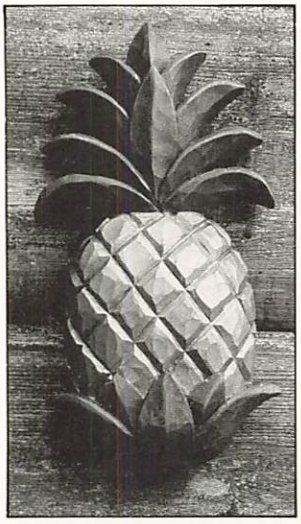
Learn Woodcarving!

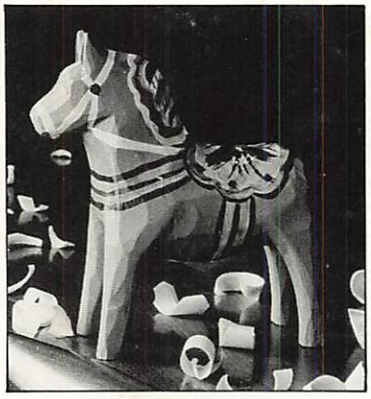
14 Projects You Can Make

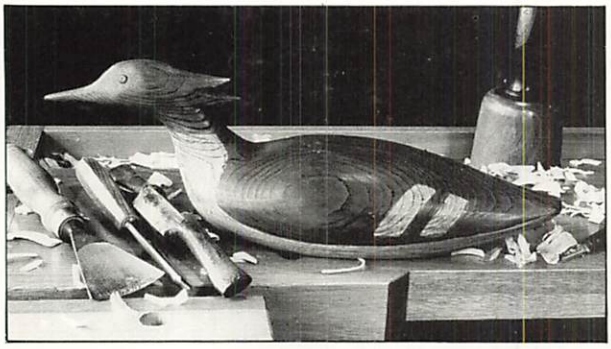
Discover the fun and satisfaction of woodcarving with master carver Rick Bütz. You'll learn about tool selection and sharpening, whittling, chip carving, wildlife carving, and relief carving. Anyone can master the techniques, most of which require only a knife and a few basic carving tools. Have fun making the featured projects, or use the carving techniques to create your own designs.

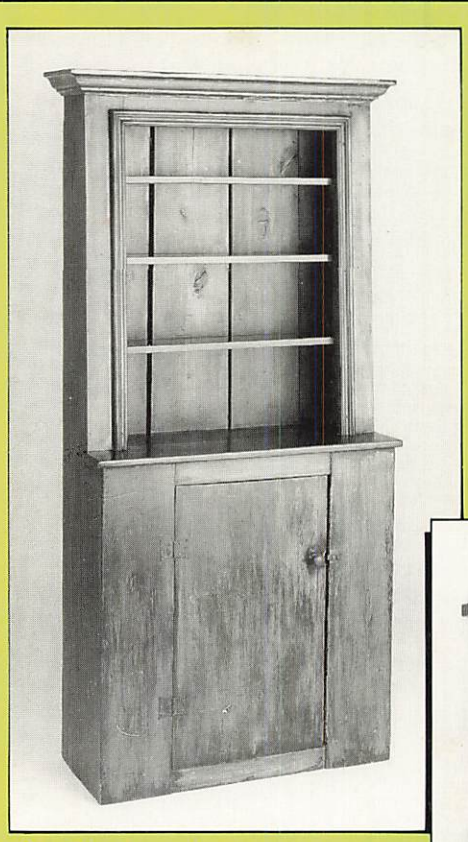
Softcover • 127 pages • 316 Photos • Full Color Section
44 Illustrations • $16.95 plus postage and handling

For ordering information, see handy order form bound in the center of this issue.





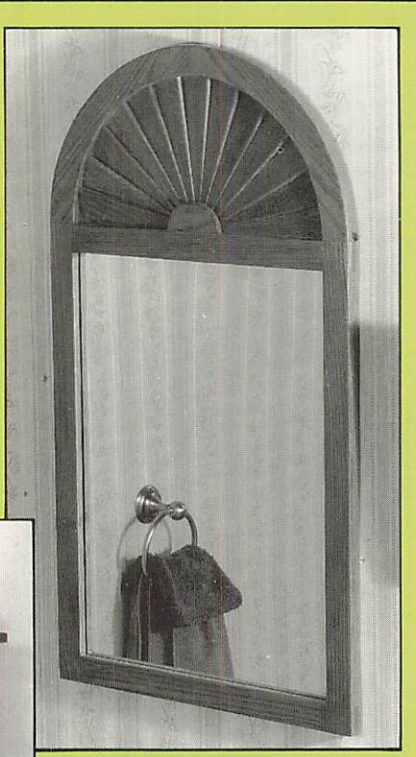




Pine Cupboard

Next Issue . . . *We've got more terrific projects coming your way. Here's just a few.*

The Pine Cupboard antique reproduction fills your workshop with the sweet smell of pine, and adds some country charm to your home. The Oak Mirror blends a contemporary flavor with traditional elements for a unique project. And the oak Plate Rack gives you a chance to make a piece from the early 20th century Arts and Crafts movement.



Oak Mirror

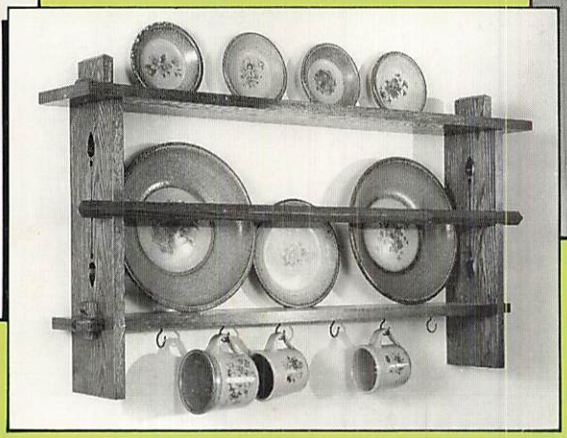


Plate Rack